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Robert Liston

ELEMENTS OF SURGERY.

BY

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ELEMENTS OF SURGERY.

PART III.

OF PARTICULAR SURGICAL SUBJECTS.

Affections of the Chest.

INFLAMMATION of the pectoral serous tissue would come to be considered more properly in a work exclusively on the practice of physic; but the affection not unfrequently occurs in consequence of wounds or other external injuries, and it is proper that it should be shortly noticed here. The most prominent symptoms are a violent pain in the chest, gradually increasing in intensity; difficult respiration, painful and often hurried; prolonged inspiration, causing aggravation of the pain; flushed face, a rapid, full, and bounding pulse, with other symptoms of inflammatory fever. The practitioner must be on his guard not to mistake violent and sudden pain in paroxysms for inflammatory; the pain of inflammatory action is steady, and increases gradually, without any intermission. Inflammation soon terminates in one way or another, and the pain which

attends it is altogether very different from such as continues for weeks, severe at one time, and slight at another.

In regard to the chest, the affections, inflammatory or not, of the internal parts, must be carefully distinguished from those of the external, as of the intercostal muscles. These are often affected from injuries, or from exposure to cold, and give rise to symptoms which may appear to indicate serious disease of the included viscera—difficult breathing, effected with great pain, and very distressing; pain on pressure and on motion of the ribs; frequent, painful, and ineffectual efforts to cough; general anxiety, and more or less disturbance of the constitution. The tendinous coverings of the costal cartilages, and of the sternum, may be involved, and sometimes considerable and painful swelling takes place in consequence. Mercurial influence is no unfrequent cause of such perichondriac affection.

Before proceeding to active treatment, that is, bleeding to the extent of pounds, the surgeon should make himself very sure that inflammation of important and vital organs does really exist. Every circumstance must be taken into consideration, and well weighed; it is far easier to take away vital fluid than to replace it. The age, temperament, previous life, state of constitution, must all be attended to. When inflammation of internal parts has actually commenced, every endeavour must be made to procure resolution; effusion and suppuration are to be dreaded, as generally fatal.

Effusion of serum may take place into the cavities, attended with subsidence of the symptoms. In such circumstances, the lung collapses, either entirely, or still admitting a small quantity of air; and if the collection lodge for a considerable time, that side of the chest enlarges. When the cavity is not quite full, the fluid is heard to be troubled; on motion of the trunk a sound of splashing is perceived. Part of the cavity may be occupied with air which has escaped from an opening in the lung; or halitus may be extricated from the accumulated secretion. There are other signs, sufficiently distinct, imparting a knowledge of such effusion. The previous history of the case leads to a shrewd suspicion. The chest is unnaturally immovable, as well as enlarged; the intercostal spaces are widened, and ultimately protuberant; there is dulness on percussion, and no respiratory murmur perceptible in those parts where there is fluid; the sounds are natural in that part of the lung which is permeable to air, and distended.

Often suppuration is the result of the incited action; and purulent matter forms in the cavity of the pleura, generally without breach of surface. The membrane is covered with lymph, more or less extensively organized. *Empyema* is established. Suppuration may take place in the substance of the lungs, and from ulceration the matter may escape, in small quantity at a time, into the bronchial tubes, giving relief to the patient; or it may be poured in profusely and suddenly so as to cause instant suffocation; or it may work its way into the cavity of the pleura, and occupy

the same place as if it had been secreted by that membrane. Or again, if the lung adhere to the costal pleura, the matter may approach the surface of the body, by the aid of interstitial absorption of the intervening parts, and the collection may then be opened like a common superficial abscess, by division of the integuments only.

When the pleura is full, the chest enlarges, the integuments become œdematous; and if, from the preceding and collateral circumstances, no doubt exist of the presence of matter, paracentesis may be performed with a chance of relieving and saving the patient. The patient is placed horizontally, with the shoulders slightly elevated; and the affected side should be as dependent as possible, that he may be readily turned over on his face should the breathing become embarrassed. The position of the diaphragm, in regard to the inner surface of the false and lower true ribs, must be kept in view. When the distension is great, this important muscle is displaced; it is pushed downwards, carrying before it the viscera in the upper part of the abdomen; it is thus removed far from the place at which the incision is usually made. The point of election, as it is called, is between the fifth and sixth ribs, and midway between the sternum and the spine. An incision is made through the integuments, over the upper edge of the sixth rib, an inch and a half in extent; in this situation there is no risk of wounding the intercostal artery. If the operator intend to shut the cavity as soon as the fluid has been discharged, the integuments are

drawn upwards previously to making the incision, in order that they may afterwards overlap the wound. A cautious opening is then made through the intercostal muscles, and the pleura punctured. This is immediately followed by forcible ejection of fluid. The wound of the pleura is then enlarged by a probe-pointed knife. The thrust of a trocar, or sharp-pointed bistoury, is here inadmissible, as in some cases the diaphragm, perhaps the liver or stomach, or even the lung, might be wounded. The fluid at first escapes rapidly; afterwards it is ejected chiefly during expiration. After its discharge, a tent is placed in the wound, over which a compress, and the chest is firmly bandaged. The closure cannot be maintained safely longer than twenty-four hours; the dressing must be undone, the tent removed, and the matter again allowed to flow. I would certainly not recommend any attempt to heal the wound by the first intention. In consequence of continued closure, the secretion soon becomes very profuse, mixed with blood, and of a putrid nature; irritative fever is established. The treatment principally consists in obtaining gradual, and at the same time free evacuation of the fluid, restraining the motions of the chest, and supporting the general strength. As the discharge ceases, the lung may in part expand; it may, however, continue collapsed, become consolidated, and the chest fall in. In neglected cases, absorption of the intercostal substance takes place; the integuments bulge outwards, and distinct fluctuation is perceived. The skin has been allowed to be-

come thin, and even to give way, without the nature of the case being known; but this can be the result only of ignorance or of inattention. In such cases the ribs have been denuded, and become necrosed to a large extent,—the sequestra separating slowly and in fragments, and causing long continued and wasting discharge. It is plain, therefore, that pointing of the matter should never be waited for. Chronic collections are occasionally met with, of years duration, and producing great enlargement of the chest. Surgical interference with such is less likely to prove beneficial than with the acute.

Wounds of the large blood-vessels of the chest, or of the cavities of the heart, are almost immediately fatal. Mere punctures, however, of these parts, have closed for a time, and in some cases even permanently. All wounds of the chest, though not involving blood-vessels of a large size, are productive of severe consequences—effusion of blood or bloody fluids into the cavities, escape of air into the external cellular tissue, collapse of the lung; and inflammation and its results are always to be dreaded. The danger is not uniformly tantamount to the extent of injury inflicted. Individuals have recovered from extensive wounds causing profuse hæmorrhage, and great displacement and laceration of the parts; whilst, from much slighter injuries, untoward and fatal consequences have quickly resulted. Wounds may penetrate the chest, and be continued into the abdomen; the stomach, liver, and intestines—one or all—may

be perforated as well as the lung ; in such cases the hæmorrhage is in general speedily fatal. Injury of the intercostal arteries, and of the mammary and its branches, is attended with serious bleeding. It is easily arrested, however, by pressure. A piece of fine linen is pushed into the wound, followed by charpie, so as to form a small bag within the chest, a little larger than the opening ; by pulling this gently outwards and fixing it, efficient pressure is made on the bleeding vessel. At the same time the motions of the chest are to be restrained by bandaging ; indeed this is necessary in almost all injuries of that part. When reaction has been established, antiphlogistic treatment must be pursued, and it generally requires to be extremely active. Bloody, serous, or purulent fluids lodging in the cavity of the pleura, are to be evacuated, if need be, either by incision or by enlargement of the original wound. In the course of the cure hectic usually supervenes to a greater or less degree, and requires the reverse of the previous treatment.

Affections of the Abdomen.

Inflammation of the peritoneum, when idiopathic, is generally treated by the physician. But it occurs in consequence of wound, obstruction from hernia, or affection of the lower bowels. There is a burning heat in the belly ; the pain is constant and increasing, much aggravated by the slightest pressure or exertion of the abdominal muscles, and the patient, in conse-

quence, lies with these muscles in a state of relaxation. The pain is of a very different character from that arising from spasm, induced by an irritating nature of the intestinal contents, which supervenes in paroxysms, and is relieved by pressure or by evacuation. In inflammation the countenance is very anxious, and generally pale; the extremities are cold and bathed in perspiration; the patient vomits frequently; and the bowels are generally constipated. The pulse is small, wiry, and rapid.

Hernia has been classed with tumours. It is a swelling, but of a peculiar kind, and attended in some states by peculiar symptoms. The term rupture is in common use instead of hernia, but was at first applied from a false notion of the disease. There is a descent of viscera, but no rupture of the parietes. By hernia is meant protrusion or escape of the contents of any cavity, but the term is most frequently applied in regard to the abdomen. The protrusion may occur at various parts of the abdomen; through the diaphragm, constituting *Phrenic* Hernia; through the umbilicus, constituting *Exomphalos*; through the dilated apertures for transmission of vessels, constituting *Ventral* Hernia; through the inguinal canal, constituting *Inguinal* Hernia; through the crural aperture, constituting *Crural* or *Femoral* Hernia. The most frequent forms are the inguinal and crural,—the effects of pressure or action of the muscles on the abdominal contents being concentrated towards the lower part of the cavity. It is but rarely that the bowels protrude through the sacroischiatic notch, or

through the obturator foramen, or by the side of the vagina, or betwixt the bladder and rectum.

It is of great importance for the student to attentively study and reflect on both the healthy and morbid anatomy of this disease. When a hernia is strangulated, there is an absolute necessity for early interference; the bowels are obstructed and their action inverted; fæculent vomiting ensues, and enteritis is threatened, along with all its dangerous consequences. He may meet with the affection at a very early period of his practice, and may be so situated as to command no assistance or advice; he must be guided by his own judgment and knowledge. He should be well aware of the relation of the parts to each other, and the changes likely to have been occasioned by the disease. If, through delay, the patient lose his life, or if an operation be attempted, and its object improperly accomplished, or not accomplished at all, his reputation may be blasted. But if he interfere skilfully, and at the proper time, and save his patient, relieving him at once from all his painful and dreadful symptoms, great credit and professional fame may be in consequence acquired. An examination of the healthy anatomy is not sufficient, many changes take place, which mere anatomical and physiological knowledge could never anticipate. Extraordinary displacements and adhesions occur. The parts are altogether changed; and repeated examination of the morbid state alone can impart the requisite knowledge to one previously well acquainted with the healthy structure.

In consequence of laceration or separation of

fibres, hernia may occur suddenly, and even in the best formed parts, from very violent exertion—as in leaping, wrestling, pulling, lifting heavy weights; from sudden exertion of the abdominal muscles in any way; from blows, &c. Or the protrusion may come on gradually, after slight exertions, where the tendons are naturally weak or deficient; or it may be slowly induced by repeated and almost constant muscular action, as in urinary, intestinal, and pulmonary complaints; in such cases, slight pain is usually felt at the site of the protrusion before the tumour is perceived. The disease is often congenital. But the common cause of abdominal hernia is powerful action of the abdominal muscles, compressing the viscera to a greater or less degree, and with more or less suddenness; the viscera resisting the compressing force, react on the parietes, and these, yielding at the points which are naturally weak or deficient, permit enlargement of the coerced cavity by protrusion of part of the contents. When the compression and reaction are sudden and violent, the protrusion is the same; but when the former are not sufficient to overcome the cohesion of the parietes by a single occurrence, but by repetition gradually effect the morbid end, the hernia is proportionally slow in making its appearance, and gradual in its increase.

To understand the nature of *congenital scrotal hernia*, the student must recollect that the testicle in the foetus is lodged in the cavity of the abdomen, immediately below the kidneys, and resting on the psoas muscle; that it gradually descends into a process of peritoneum, called spermatic, which extends

from the general peritoneal cavity down towards the scrotum, and which ultimately constitutes the tunica vaginalis. The orifice of this peritoneal pouch not closing immediately after the descent, may permit a fold of intestine to slip into its cavity, and remain in contact with the testicle. Or the testicle may, though rarely, contract in the abdomen an adhesion to a portion of bowel, and in its descent bring this along with it. In either case the bowel remains in its new situation, and constitutes congenital hernia.

Hernia infantilis differs from the hernia congenita, and is a kind of protrusion peculiar to the early period of infancy. In the congenital form the protruded intestine is in immediate contact with the testicle, and surrounded by the tunica vaginalis testis; but in this a process of peritoneum is interposed betwixt the intestine and the vaginal coat. The affection occurs after the abdominal aperture of the spermatic process has closed, but before the rest of that process has become incorporated with the spermatic vessels and their surrounding cellular tissue. In fact, only the peritoneum proper has closed, and forms the septum between the cavities of the abdomen and of the tunica vaginalis; but being insufficient to withstand the impulse of the abdominal contents, yields before it, and descending along with the protruding portion of bowel, forms its envelope, or the proper hernial sac, within the cavity of the tunica vaginalis.

Such is the opinion generally adopted in regard to the nature of hernia infantilis; but its accuracy is doubtful. It seems more probable that the bowel, covered by a fold of peritoneum, is protruded into the

cellular tissue of the spermatic chord, after closure and contraction of the spermatic process, and descending till it reach the upper and posterior part of the tunica vaginalis, adheres to this tunic, bulges it forwards, and is covered by it. On cutting down in such a case, the hernial tumour may appear to be lodged within the tunica vaginalis; whereas the bowel is actually placed exterior to the tunic and behind it. Indeed, the case is similar to the common scrotal hernia, only the tumour is behind, not anterior to the vaginal coat. And this relation of parts is more apt to occur in the infant than in the adult; for in the former the testicle does not for some time descend fully into the scrotum, and whilst it is lodged in the groin a fold of peritoneum protruded into the spermatic chord may soon contract adhesion with the tunica vaginalis, afterwards descending along with it and the testicle. The subjoined case, illustrative of the preceding statement, came under my observation in 1814. J. S. *æt.* 21, was admitted into the Royal Infirmary, with symptoms of strangulation which had been of eight days' duration. The hernia had existed from infancy; it was on the right side, and tolerably large. In the operation, on dividing the integuments and various coverings, a sac was opened, which proved to be the tunica vaginalis, containing the testicle, a considerable quantity of serum, and a large smooth transparent tumour above the testicle and behind the posterior layer of the tunica vaginalis. The operator was puzzled, but finally determined on cutting into this tumour; it proved to be the hernial sac, covered by the tunica vaginalis, containing three or four ounces

of serum and a portion of omentum. The protrusion could not be returned; after relieving the stricture, the omentum was cut away, and the bleeding vessels tied separately. The patient died on the third day after. An analogous case is on record; and a third has been related to me by an old and experienced surgeon: In that instance, both the anterior and posterior layer of the tunica vaginalis, together with the true sac, were simultaneously divided; omentum and intestine protruded into the vaginal coat, and for a time the opening through the posterior part of that cavity and sac was mistaken for the inguinal ring. On extension of the incision, the nature of the case became more apparent, the stricture was relieved, and the protrusion reduced.

Children are sometimes born with deficiency of the umbilicus, and protrusion of bowel into the loose cellular tissue of the umbilical cord; the disease is termed *congenital exomphalos*.

Almost all the viscera of the abdomen and pelvis are liable to protrusion—the stomach—the spleen—the omentum—the great and small intestines, and even some of their most fixed parts—the ovaria—the bladder. Also, right portions of the viscera occasionally escape on the left side of the parietes, and the left at the right.

Hernial protrusion has received different names, according to the nature of its contents. When composed of a portion of intestine, it is termed *Enterocoele*; *Epiplocele*, when composed of omentum; and *Entero-epiplocele*, when both intestine and omentum have escaped; and, as already observed, different

names are also applied, according to the situation of the protrusion.

The inguinal and crural forms of hernia being the most common, will chiefly occupy our attention. The inguinal is divided into *true* or *oblique inguinal*, and into *direct* or *ventro-inguinal*. In the oblique, the protrusion passes along the inguinal canal. This course is in young persons short, but as the muscles become developed it is lengthened to about two inches, reckoning from the external ring to the funnel-like opening through the transverse fascia. The appearance of the swelling in this canal leads to diagnosis betwixt the oblique and direct hernia; but in chronic cases, this distinction is often in a great measure done away with. In large and old oblique ruptures the neck of the tumour is shortened, and the openings of the canal are approximated and more in a direct line. They are also immensely dilated, being often enlarged to such an extent as to admit all the fingers of the hand, when placed in a conical form,—and this even in the living body, the loose integument receding along with the tumour. The epigastric artery is situated behind the neck, and on its inner side. It is much displaced inwards in cases of old standing. The direct hernia passes through the parietes opposite to the external ring, and does not come in contact with the spermatic chord until it has reached that point. Its neck is short, and the epigastric artery is on its outer side. The coverings of the two tumours are different. Those of the oblique are such as the chord possesses, a prolongation of the transverse fascia, a covering from the cremaster muscle, fibres

from the edge of the external ring, and the superficial fascia of the abdomen. The direct has only the last.

The oblique inguinal, when recent and small, is termed Bubonocele; but when large, it generally descends into the scrotum—oscheocele—of course exterior to the tunica vaginalis; and in females into the labium. The tumour often attains an immense size, from continued application of the causes that produced it,—laborious occupations, or straining of muscles in any way. When of long duration, and not attended to, it is not uncommon for the swelling to hang as low as the middle of the thigh, or even down to the knee. In such cases, the testicles often are wasted, and the penis concealed; indeed the skin of the penis, as well as of the lower part of the abdomen, is stretched over the tumour. Crural or femoral hernia is, on the contrary, seldom larger than a small apple. Sometimes, but very rarely, the tumour is of large dimensions. I have seen one containing the transverse arch of the colon, the omentum, and a yard and a half of small intestine.

When a very large hernia remains always full, the cavity of the abdomen diminishes in size; in fact, it adapts itself to its contents; and this must be kept in mind when interfering with such cases.

Inguinal hernia most frequently occurs in males, the femoral in females; and the reason of this is obvious on comparing the size of the inguinal and crural openings in the male and female. In the male, the inguinal opening is much larger than the femoral; in the female, the femoral is the larger, the inguinal is

small, containing only the round ligament of the uterus. The causes of hernia act equally on both openings, and therefore it is to be expected that protrusion will take place where there is the least resistance, where the parietes are most deficient.

Hernia can seldom be mistaken for any other swelling, by one at all acquainted with his profession, and who makes his examination attentively. The history, and the mode of its appearance, are to be attended to. The swelling proceeds from above—at times it recedes on the patient lying on his back and making pressure on the swelling—a distinct impulse is communicated to it on exertion of the abdominal muscles, as in coughing—the tumour is generally elastic, and its neck can be felt extending from the lower abdominal aperture. Also, the two kinds, inguinal and crural, can scarcely be confounded with each other; the former is above, the latter below the ligament of Poupart. It will be proper, however, to enumerate shortly the diseases for which hernia may be mistaken.

Cirsocele may be confounded with inguinal hernia. *Cirsocele*, being a varix of the spermatic veins, enlarges on coughing and during the erect posture, like Hernia; but in general the composition of the tumour can be ascertained by the feel which it imparts when handled,—the veins feel like a handful of earthworms. Besides, the swelling is made to disappear, on emptying the dilated veins by pressure upwards; and if the surgeon then firmly compress the inguinal aperture, the tumour will rapidly reappear, on account of the venous flow being inter-

rupted, particularly if the patient exert his abdominal muscles, or assume the erect posture. Whereas, had hernia existed, the swelling could not have been reproduced; and on the patient being directed to cough, a distinct impulse would have been felt with the finger. *Hydrocele* of the tunica vaginalis may be confounded with scrotal hernia, if its distinctive characters be not understood or attended to. The pyramidal swelling is of an equal surface, fluctuates, and is generally diaphanous; its formation is gradual, commencing at the lower part, and slowly ascending; the testicle cannot be felt at the bottom of the scrotum; there is no swelling at the inguinal canal, and the chord is felt free; the tumour is not affected by the position, motion, or exertions of the patient. These circumstances plainly indicate the nature of the case. Bubo, sarcocele, and acute swelling of the testicle, are sufficiently distinguished from hernia by their situation, form, feel, and history, and cannot be confounded with it save by the profoundly ignorant. *Hydrocele of the spermatic chord* is more likely to lead to deception when large; but it is generally small and circumscribed, involving the middle of the chord, leaving the inguinal aperture free, and the upper part of the spermatic chord distinct. Besides, whatever may be its size, its formation is always slow and indolent, it is never capable of being pushed into the abdomen, and it is unaffected by those circumstances which contribute to mark hernia. But hydrocele of the chord and hernia may coexist, as in

the following instance:—A gentleman had swelling in the course of the spermatic chord for many years, while in a warm climate. Bandages were applied, and great pain thereby occasioned. After his return to this country, pain in the belly and vomiting seized him on a Monday morning, and continued with more or less violence till Sunday. Then the vomiting became fœculent, the belly excruciatingly painful and tender, the tumour tense, and the pulse weak. A physician opposed operative measures, having been convinced that his former complaint was a hydrocele of the chord. But I conceived the symptoms warranted cutting down on the parts, and did so. A hernia was found containing omentum and a fold of bowel; a hydrocele of the chord lay alongside of it.

Crural hernia has been mistaken for bubo, and *vice versa*. Lumbar abscess and varix of the femoral vein are also supposed to resemble it in some measure. The situation and form of the tumour in lumbar abscess is very different from those of hernia; and the mode of examination recommended in regard to cirsocele is equally applicable to the detection of dilated femoral vein. The distinctions between crural hernia and bubo are too obvious to require mention.

Patients with unreduced hernia are constantly in great danger; bruising of the swelling, or accumulation of fœces in the protruded bowel, are likely to occasion very unpleasant consequences. They are generally troubled with indigestion, flatulence, and constipation; a slight degree of constriction at the neck of the tumour produces an obstruction to the

intestinal contents; the viscera in the sac have not due support and pressure, hence accumulations take place in them, and may be productive of serious and even fatal effects. No protrusion, in which these circumstances are likely to occur, should be allowed to exist if possible. So afraid were the ancients of allowing herniæ to remain unreduced, that it was their custom to cut all patients labouring under rupture who would submit to the operation; and this was generally performed by itinerant quacks. They returned the protrusion without opening the sac, and then the neck of the tumour was either stitched up, or tied along with or without the spermatic chord. The actual cautery, and the most powerful caustics, were also applied to the parts by some, and dreadful were the effects; yet after the neck of the sac had been destroyed, and perhaps the bone exposed and exfoliated, protrusion again took place by the side of the cicatrix. By many, castration was considered necessary for the cure of scrotal hernia. Such harsh measures were founded on erroneous and imperfect ideas of the nature of the disease, and are not to be met with in the present day. Operations for unincarcerated hernia are not justifiable, and those who have operated in such circumstances give a very desponding account of the experiment.

The external applications employed to reduce hernia are various. Some are supposed to produce corrugation of the integuments, and contraction of the cremaster muscle, and thereby to force up the protruded intestine; others are of an astringent charac-

ter, and their administrator may gravely believe and say, that by them he expects to tan the living scrotum, to reduce the hernia, and to present an insuperable obstacle to its reproduction. But all such means are visionary, and practically ineffectual; no external or internal remedy can attenuate and reduce the hernial sac, remove adhesion, or produce contraction of the tendinous and rigid apertures.

Herniæ are either *reducible* or *irreducible*. A hernia is said to be reducible, when the protruded bowel or viscus readily returns into the abdomen on the application of pressure to the swelling, or on the patient assuming the recumbent posture. When recent, the swelling may not be made to disappear without considerable difficulty, but after the disease has become of long duration, the aperture through which the protrusion has taken place dilates and is relaxed, and admits of the ready passage of the hernial contents; such tumours are usually of considerable size. But reducible herniæ should not be permitted to enlarge, since their protrusion can be prevented by simple and safe means; after reduction, a properly fitted bandage, termed *Truss*, is applied over the aperture and canal, and by the compression thus made, the opening is rendered impervious to the abdominal viscera. In inguinal hernia, the pad of the truss must make equable compression over the whole of the canal; in the other species, the aperture is less extensive, and the pressure more direct. Perseverance in the use of a well-adapted truss is highly necessary in children from the first, so that a chance may be afforded of

permanent cure by contraction of the opening and developement of the surrounding parts. In young persons the canal is short, and almost direct, and from its becoming oblique and elongated during growth, prevention of protrusion may be effected. Descent must never be allowed during such attempts at cure. But in adults such a fortunate result can scarcely be expected; the truss must be constantly worn during the day, in bed it may be disused, and the patient must rest satisfied with thereby escaping those dangers to which protrusion of the hernia would render him always liable. Great care should be taken to ascertain in the morning, before the truss is applied, that no protrusion exists. If the opening be not much dilated, it may contract even in adults when protrusion is sedulously prevented. The patient will also require to avoid the causes of hernia. If he is subject to cough, or labours under urinary disease, by which the abdominal muscles are called frequently and fully into action, there is no chance of a cure; the continued use of a truss will alone afford safety.

Hernia is rendered irreducible, 1. By the formation of adhesions between the sac and the included parts. 2. By induration of the protruded omentum, and by accumulation of fat in it, or in the appendiculæ of protruded large intestine. 3. By contraction of the abdominal cavity from long-continued displacement of a large portion of its contents. 4. By the nature and connexions of the protruded part, as in hernia of the sigmoid flexure, or of the caput cœcum coli. 5. By firm compression of the abdomen. 6. By the tight-

ness of the opening giving rise to engorgement of the protruded parts. 7. By accumulation of fœces, solid or fluid, in the protruded portion of bowel. With care, some of these causes may be got over, and the tumour reduced. In irreducible hernia the use of a bag truss is indispensable to prevent increase of the protrusion. In irreducible femoral hernia of small size, a hollow pad with a weak spring is used with advantage, to give support to the contained parts, prevent farther protrusion, and guard the tumour against external violence. The patient must avoid violent exertion, keep his bowels open, and be careful of his diet ; he is always in danger, and should know it. Many have lost their lives from blows otherwise not dangerous ; and even straining at stool is sufficient to force additional portions of viscera into the neck of the sac, and thereby induce most serious distress.

The term *incarceration* of hernia is employed to indicate a slight degree of *strangulation*, when the hernial contents are confined from any cause, and when the circulation in the protruded bowel and the course of the fœculent matter are nevertheless uninterrupted. By many it is applied indiscriminately with strangulation.

Strangulation arises, not from any change in the neck of the sac or in the tendinous aperture, but from increase of volume in the protruded parts, caused by accumulation of the solid, fluid, or gaseous contents of the bowel, followed by interruption to its circulation ; or the interruption to the flow of blood may

precede the distension. The circulation is more readily retarded or arrested in the veins than in the arteries, and consequently the engorgement of the bowel is at first caused by venous turgescence; but when the flow in the arteries is at all impeded, the infiltration and exudation become more rapid, and the part quickly perishes—sphacelates. The symptoms which accompany and indicate strangulation are of a very imposing nature, and cannot be neglected; and it is fortunate that such is the case, for no disease is fraught with greater or more immediate danger to the patient, or requires more the early interference of a skilful and expert surgeon. The tumour becomes tense and painful, and the integument is often red and shining; the pain is much increased by pressure, and extends over the abdomen, but continues most severe near the neck of the swelling; sickness and inclination to vomit quickly follow; the patient feels languid; his countenance soon assumes a contracted anxious appearance; the circulation is hurried; the pulse beats wiry and hard, though at first it may have been full. If relief is not afforded, all the symptoms are speedily aggravated; vomiting comes on, and is frequent; no discharge can be procured from the upper bowels, though the lower may be, and often are, evacuated by injections or by natural efforts: if the upper bowels evacuate downwards, the strangulation cannot be of the whole calibre of the gut, but only of a part. Pain and heat in the tumour and belly increase; and the former becomes very tender, and tense as a drum. The circulation is

more hurried, and restlessness and intolerable anxiety supervene. The patient becomes worse and worse every hour ; fœculent matter in large quantity is vomited or gulped up with great distress, and is com-mixed with bile, with vitiated mucous secretion from the stomach and bowels, and with whatever may have been recently swallowed ; in fact, the peristaltic action of the alimentary canal above the strangulated part is inverted, and all the contents are ejected. Troublesome hiccough comes on, and this symptom is by many considered as a sure sign of gangrene having taken place ; but it is often present when the bowels are quite free from tenderness or tendency to gangrene. The extremities grow coldish ; the pulse is unequal and fluttering, and with difficulty counted at the ankles. The countenance sinks, and assumes a leaden hue ; the pain abates suddenly ; the eyes are glassy ; the tumour is flaccid, often livid and emphysematous. Now, the bowel may recede, and fœculent evacuation take place, with some relief ; but the patient, after lying some time insensible, expires. All this may occur, either within twelve or sixteen hours after the occurrence of strangulation, or not till after many days. The rapidity of the symptoms and the danger are influenced by the size of the tumour and the condition of its neck, and by the nature of its contents. In small recent herniæ, the advance from bad to worse is usually very rapid, the aperture through which protrusion has taken place being small, and effecting a great degree of constriction when distension and engorgement occur. When the neck of

the tumour is large, and completely occupies the aperture previously to the strangulation, the progress of the symptoms is also rapid, for a similar reason. But if the hernia be large and of long standing, and if the protruded parts are not bulky at the point of protrusion, the constriction is in general not very severe, and the distressing consequences progress more slowly. The symptoms are not so violent in epiplocele as in enterocele. In many instances of the former, the intestinal discharges are never obstructed, though great irritation and inflammation may be induced by the strangulation. There is also less danger in entero-epiplocele, than in enterocele, compression of the bowel being in the former instance diminished by the intervening omentum.

It is scarcely necessary to observe, that when the train of symptoms just detailed commences in any case, the surgeon must immediately enquire as to the existence of external hernia, for often the disease is concealed, particularly by females; all parts where protrusion is likely to occur, must be examined attentively. At the same time, the surgeon must bear in mind, that pain of the abdomen, with symptoms resembling those of strangulation, in fact, that enteritis, with obstruction, may exist along with hernia, but independent of it. A person with hernia is as liable as any other, if not more so, to inflammatory attacks in the abdomen from a variety of causes. The portion of bowel in the tumour may participate or not in the general abdominal affection; if unaffected, it may be reduced; it is neither painful nor

tense. Again, in large ruptures, inflammation of the contents may take place without strangulation, and without affection of the parts within the abdomen. All circumstances bearing on the case, must be well considered by the surgeon, before making up his mind as to the nature of the affection.

Returning the contents of the hernia into the abdomen is the only effectual means of counteracting the direful effects of strangulation ; and the propriety of an early recourse to this measure must be quite apparent. It is indispensable, and no delay is warrantable. The means for accomplishing it must be varied, according to the state of the parts, the duration of strangulation, and the general symptoms. The most simple method, and that which should first be attempted in ordinary cases, is the *taxis* ; that is, reduction by pressure with the hand. In this, the position of the patient is of importance ; it should be such as effects relaxation of the tendinous structures through which the hernia has protruded, and through which it is to be returned. With this view he is placed on his back, with the shoulders and pelvis elevated, and in crural hernia the thigh is bent on the trunk, and turned towards the opposite side ; thus the aperture is relaxed along with the fasciæ which compose it. Long ago, the positions into which patients were forced for the cure of hernia were various, and generally awkward ; they all tended towards more or less complete inversion of the erect posture, and thus it was supposed that the abdominal bowels dragged on those protruded, and thereby assisted re-

duction. But the viscera are equally pressed on in every position of the body ; it is not they, but the external parts, that are affected by change of posture. During the attempts at reduction, the patient should be exhorted not to strain or resist, but to relax his muscles ; and it will be well to engage him in conversation, that he may not have an opportunity of keeping his lungs distended, and thereby acting forcibly on the abdomen. Very gentle pressure is to be used. At first, it should be general, applied either with one hand or with both, according to the size of the tumour, so as to diminish the contents. If air be heard gurgling at the neck of the swelling, the chance of success may be considered good, for a return of part of the bowel's contents is thereby indicated. Then a gentle kneading should be made at the neck with the fingers of one hand, while with the other general pressure is kept up. The impression made is at first slight and gradual, but when a portion of the bowel returns the rest of it slips up suddenly. The return of omentum is always slow, and the last part requires as much manipulation as the first. The direction of the pressure must be varied according to the case. In inguinal and ventro-inguinal hernia, it is made in the direction of the neck of the sac ; in the former upwards and outwards, in the latter upwards and backwards ; and previously the body of the tumour should be brought into the same line with its neck. In crural hernia, the pressure must first be made towards the centre of the thigh, so as to bring the whole tumour

into the same direction with its neck, and then upwards. In umbilical, the pressure is straight backwards. Small herniæ, and those of recent origin, are with difficulty reduced ; their neck is narrow, and the passage proportionately small ; the crural are usually of this description. In all herniæ, after strangulation has existed for some time, and adhesions formed, particularly at the neck, reduction is almost impossible.

The taxis is to be neither attempted nor persevered in after the hernia has become tender and inflamed. No good can be done by it, and the patient's chance of recovery by operation is much diminished. Even when no pain is felt in such circumstances, any degree of force must be prejudicial. Mortification of the bowels is often hastened by the taxis being unskilfully employed by ill-informed practitioners, who are determined, at all risks, to accomplish speedy reduction of the viscera. Men, even eminent, may declare that they always succeed in the taxis, but such practice is highly dangerous. The surgeon will take care to inform himself of all particulars,—as to the duration of strangulation, the previous state of the tumour, if it was all, or only in part reducible, as to its size, &c.,—before proceeding in any way. Great mischief is likely to accrue from the tumour being handled, perhaps roughly, by many people.

Certain means may assist the taxis, but they should not be long continued or often repeated. Venesection can be employed only in strong plethoric patients, in the very first stage of strangulation, and before the

patient is exhausted by the distressing symptoms. It is had recourse to in order to induce syncope, or an approach to it, during which general relaxation takes place, and reduction may be attempted with advantage. With that view the patient is placed erect, and a large orifice made in the vein of one or both arms, so that a moderate quantity of blood suddenly abstracted may have a powerful effect on the system. In several cases I have found this practice beneficial, but am inclined to say, that in general, it will not be followed with success. In a favourable case, one attempt of this kind may be made, but not repeated. In many states of the constitution, and in the latter stages of the disease, bad consequences must follow the practice. But in regard to it or any other remedy, it would be folly to lay down positive general rules; what may prove useful in one or two instances, may answer very ill in the majority of cases that come under treatment. Local bloodletting can have no effect in diminishing the size of strangulated parts; though in inflammation of the contents of the tumour, without strangulation, no more powerful means can be employed.

Purgatives have been recommended with the view of extricating the bowel by increased peristaltic motion, but the symptoms will, to a certainty, be aggravated by their use. Purgative enemata can do little good; if in small quantity, they empty only the rectum; if large, they may reach the strangulated part, but will scarcely be able to extricate it.

Emetics have been supposed to be indicated in this

affection as well as in ileus ; but there is in general enough of vomiting without them ; and often it is difficult to allay the vomiting even after removal of the obstruction.

The warm bath is greatly trusted in by some, and in many cases it proves a valuable and useful auxiliary to the taxis. It acts beneficially by inducing general relaxation, or even syncope, during which, whilst all resistance of the compressing powers upon the contents is suspended, pressure on the tumour can be employed to good advantage. By steady perseverance, whilst the patient is in the bath, a great majority of strangulated herniæ may be reduced. But neither the general nor the local application of heat, or any other known means, save the edge of the knife, can relax tendinous apertures farther than can be effected by attention to position. Irrecoverable and most precious time may be wasted in preparing the bath, and for this reason such means should never be resorted to, unless they can be commanded at the shortest notice.

If fomentation is used at all, it must be general ; local fomentation can do no good. The apertures can be neither relaxed by heat, nor contracted by astringent applications. By the local application of heat, the size of the parts composing the hernia will be augmented, the flatus being rarified, and the effusion and engorgement encouraged.

The cold bath, and the dashing of cold water on the surface, near the seat of the disease, have been tried in some rare cases with most marked success ;

but this is a practice not to be relied on. It can act only by producing sudden and powerful contraction of the coverings, and uniform pressure thereby on the contents. It is, perhaps, only applicable to scrotal hernia. Cold has been applied to the tumour, and even ice, so as to produce frostbite, but little faith can be placed in such ; the practice becomes dangerous after inflammation has existed for some time, the application diminishing the weakened powers of the parts, and accelerating gangrene.

Opium has been given by the mouth, and tobacco by the lower extremity of the alimentary canal ; the former may sometimes prove advantageous, but the latter had better be dispensed with. The tobacco is thrown up either as an enema, or in the form of vapour ; but the former method is generally preferred. A drachm of the leaves is infused in a pound of water for ten minutes, and one-half of the liquid injected ; if this prove insufficient to prostrate the patient, the rest is administered after the lapse of a short interval. But many people have thus been poisoned, and the indiscriminate employment of the supposed remedy cannot be too strongly reprobated ; its effects are most severe and unmanageable ; the state of collapse is most complete and alarming, and it is often difficult, if not impossible, to bring the patient out of it,—to procure reaction. In some cases reduction may be accomplished during the state of extreme debility which follows its use, but I have often seen it fail, and have witnessed the operation afterwards performed on the patients, who were at

the time without pulsation, from whom no blood flowed after the incisions, and who never rallied, but sunk rapidly. Indeed the patient is always in a very unfavourable state for operation after the exhibition of the tobacco enema, though certainly in a very favourable state for reduction being attempted. The strong objection to the medicine, I conceive to be its being so extremely unmanageable; it is impossible to say whether the depression of the vital powers that must ensue will be just sufficient to induce that relaxation and debility necessary or favourable to reduction, or whether it will proceed uncontrollable to such a degree as to extinguish life. In general it produces intolerable nausea and depression, universal relaxation of the muscles, coldness of the surface, with clammy exudation, vomiting, and violent retching, vertigo, and perhaps insensibility. Were I so unfortunate as to be the subject of strangulated hernia, I should certainly have no tobacco used. After unsuccessful trial of the taxis, I might submit to be bled ad deliquium, and have a surgeon to attempt reduction during syncope; if somewhat more advanced in life I should prefer the warm bath; if this failed, I should certainly be operated on in a very few minutes afterwards. If the surgeon, after mature consideration, make up his mind as to the course of practice he would wish pursued in his own case, he will be fully alive to the necessity of impressing the utility of it on his patients, and have little difficulty in persuading them to submit to his proposals. No time should be dissipated in administering purges or clysters, or

in cold or warm applications; and, for my part, I should never advise tobacco.

If the tumour is not very tender, make one good trial of the taxis, not long continued; and if a warm bath can be readily commanded, place the patient in it, and employ the taxis when he begins to feel faint. If foiled, and if the patient can bear depletion well, the strangulation being recent, try a full bleeding to syncope; it may save depletion afterwards, and at all events the patient will be no worse of it. Having failed, as may probably be the case, operate without delay.

The operation is neither formidable nor dangerous of itself; the delaying of it is attended with the most serious and irretrievable mischief. It ought to be performed within a very few hours after the occurrence of strangulation, and, in most instances, without putting off time with the means considered auxiliary to the taxis. Under urgent circumstances, it may be necessary to operate within a quarter of an hour after seeing the patient, as I have often done. In ordinary cases, time must be taken to converse with the patient and his friends, to convince them that all those means likely to assist reduction, and render an operation unnecessary, have been tried. The surgeon must not appear to be in a hurry, though he puts off no time unnecessarily, otherwise his motives may be misconstrued.

The necessity for operating early is greater in small than in large herniæ, in crural than in inguinal. The groin and neighbouring parts are to be shaved, and

the patient placed in the recumbent posture, with the shoulders slightly elevated. The mode of operation must be varied according to the nature of the tumour, its size, and other circumstances.

The operation for inguinal hernia is conducted as follows:—The patient is placed recumbent on a table, or, in private practice, on the side of a bed, his shoulders supported by pillows, and his feet resting upon a stool. An incision is commenced about an inch above the external abdominal ring, and continued to the bottom of the tumour. This latter part of the procedure, however, is applicable only to small and moderately-sized herniæ; in large tumours the wound is not made so low, for in them the bowels may be irreducible, from the quantity protruded, and the contracted state of the abdominal cavity: in such cases the incision should be only to such an extent as is sufficient to enable the operator to reach the stricture. The first cut is carried through the skin and fatty matter, not deeper. The layers are then divided successively, with the hand unsupported; and this is done only at the middle and projecting part of the swelling. It is unnecessary to prolong the incision of the layers along the whole extent of the wound in the integuments, at this stage of the proceedings. In the direct hernia, which is of rare occurrence, there is but one proper layer, that furnished by the superficial abdominal fascia: not unfrequently there is an imperfect additional envelope, furnished by fibres from the edge of the external ring; but in the common inguinal hernia there are three or four, and these are thickened more or less according to the

size and duration of the tumour. The division of these layers must necessarily be conducted with great care and caution. At length the sac is exposed. This is opened by pinching up a portion betwixt the nails of the thumb and forefinger, and then cutting with the blade of the knife laid horizontally. On wounding the sac, there is usually evacuated a small quantity of brownish serous fluid. The probe-pointed bistoury is then taken up, and insinuated into the opening; and by this instrument, guided on the forefinger of the left hand, the sac and its coverings are divided up to near the ring, and down to near the bottom of the tumour. The hernial contents are thus exposed. These are unravelled, and examined attentively; if only brownish red, from accumulation of the venous blood, of unbroken surface and unadherent, they are fit to be reduced. The stricture is felt for with the forefinger of the left hand, and into it either the point of the finger or the nail is gently insinuated. The protruded parts, if voluminous, are held down by an assistant, and along the forepart of the finger is passed a probe-pointed, narrow, and slightly curved knife. In carrying this upwards, the blade is placed flat with the finger, and its point, and no more, is passed through the contracted part; its edge is then turned forwards, its back resting on the finger, and by raising the handle gently, a slight incision is made into the more resisting fibres, in the direction of the mesial line. The instrument is withdrawn with the same caution as in its introduction. The finger now enters easily, and by raising it gently and repeatedly, the parts are dilated. It is then

passed upwards to the site of the internal ring, and if this be found narrow and contracted, the edge of the knife is to be directed against it in a similar way, and dilatation to a sufficient extent effected. Now reduction is to be commenced, and in doing so the same precautions are to be observed as in the employment of the taxis. In general, the omentum, if any, is put back first, and then the bowel; but this must depend on the relative quantity of the parts, and other circumstances. With the right hand the bowel is to be compressed as uniformly as possible; and, if at all obstinate, its reduction may perhaps be accelerated by pulling down a small portion at the neck, so as to facilitate the return of the fæcal contents. By gentle pressure with the forefingers one portion is put back after another; it is wrong to attempt sudden and entire reduction; it should be gradual and successive. In many cases, from adhesion, or from the bulk and nature of the hernia, the parts, though sound, cannot or ought not to be reduced; a portion may be got back, but part requires to remain. This can' often be ascertained beforehand by proper enquiry into the history of the case, as to the duration of the disease, and the period at which the whole tumour could be made to disappear. In such cases, the stricture should always be freely relieved. When the bowel is mortified, and its contents effused into the sac, care is to be taken not to detach or disturb the adhesions at the neck, and the bowel should be opened so as to allow free discharge. When the bowel or omentum are comparatively sound, though irreducible, the surgeon

must rest contented with relieving the stricture, then cover the parts with the integuments, and promote union of the wound. If it be considered necessary to remove condensed and tuberculated omentum, it is cut off, and separate ligatures of fine silk are applied to every bleeding vessel on the cut surface; the whole mass is not to be included in one noose, as was formerly the practice.

In the operation for femoral hernia, the position and preliminaries are the same as for inguinal. A longitudinal incision is made from above the margin of Poupart's ligament to a little below the middle and most prominent part of the tumour. This is crossed by another at its lower extremity, the whole resembling in figure the letter T inverted; and the two flaps, so marked out, are reflected. Sometimes a single incision, from above the neck of the tumour to the lower border of it, is sufficient to afford room for the after proceedings. One layer is found covering the sac, furnished by the strong and dense cellular tissue which occupies the space under the crural arch and falciform process of the fascia lata; it is generally denominated the fascia propria, but has by some been described improperly as the sheath of the femoral bloodvessels. It is carefully divided, so as to expose the sac. This not unfrequently is thickened very considerably, a quantity of dense fatty matter being intimately incorporated with it; but in general it is thin, and appears of a dark colour in consequence of the bowel and effused bloody serum being seen through it. It is opened with great caution, part of it being raised and touched with the edge of the knife

held horizontally or nearly so. The aperture, thus formed, is enlarged by means of the probe-pointed knife, which is carried upwards along the forefinger of the left hand. Some recommend that the sac should be left undivided, and that the stricture should be relieved by passing the knife on the outside ; others, that only the neck of the sac should remain entire, and the stricture be attacked also on the outside of the peritoneum. But this appears an unnecessary and unprofitable precaution. The extreme difficulty of returning the sac is now well known and generally acknowledged ; indeed, reduction of it, whether opened or not, is practicable only in recent cases. Its neck, besides, is firmly constricted, and the bowel may and will remain strangulated when returned along with its sac, for the peritoneum long retains the contraction at its strictured point. This happened in an unfortunate case in which, on account of the sac being unusually thick, and intimately resembling the structure and feel of bowel, I unwittingly returned the tumour along with its covering. The bowels were not relieved, the symptoms continued unabated in urgency, and a fatal issue soon occurred. The stricture cannot be relieved unless the neck of the sac is cut along with the resisting fibres exterior to it. After the sac has been opened, the forefinger of the left hand is passed up to the crural ring ; and it should be recollected that this opening is very small, even in most cases in which a hernia of ordinary size has existed for some time. It is capable of great dilatation, however, as takes place in very old ruptures ; it may admit two or three fingers easily. But in general,

only the nail of the finger can be insinuated into it ; and this organ is a better and safer conductor for the knife than a grooved director. The edge of the stricture is felt very sharp ; the point of the finger is turned towards the pubes, and along it a narrow, blunt-pointed, curved bistoury is passed in close contact, and with the edge towards the pubes ; its mere point is pushed beyond, and then the position of the blade is changed, its back is turned upon the finger. This slight motion is often sufficient to relieve the constriction on the protruded parts, and permit their reduction ; if not, a few more fibres are cut by raising the handle of the knife gently from the palm of the hand. The direction of this incision is towards the tuberosity of the pubes, inwards and forwards. Thus only the crescentic portion of the crural arch is cut ; and the division of this produces sufficient relaxation of the neighbouring parts. There is danger in cutting directly forwards, particularly in the male, at least if the incision be made to any considerable extent ; there is a risk of wounding the chord, and the obturator artery has been met with in a few instances coursing round the neck of the sac. This distribution of the artery, however, is rare, and can occur only when the epigastric and obturator arise by a long common trunk, and even then it may not encircle the neck of a hernia, as I have witnessed. Occasionally a vessel passes round the opening, connecting the epigastric with the obturator, when these arteries follow their usual course ; and this also may surround the neck of the sac. If vessels should exist in this situation in a

person the subject of operation, as has not happened so far as I know, they would be felt by the finger used to conduct the knife. And the bistoury should never be passed—for there is no necessity for it—through the opening so far as to meet with a vessel, even if awkwardly placed. The danger of cutting forward and to any extent has already been spoken of; such incision can answer no good purpose. The stricture is not in Poupart's ligament—though at one time it was proposed to cut this through without interfering with the tumour at all—but in the crural arch underneath, and in a manner independent of the strong tendinous chord and expansion. The crural arch is formed by the junction of the fasciæ of the thigh and abdomen, superficial and deep. It is inserted into the linea ileo-pectinea, where the tendon of the external oblique has no connexion, and is strengthened by fibres from the internal oblique, transverse, and recti muscles. The crural aperture formed by this arch is relaxed by flexion and inversion of the thigh, and by relaxation of the abdominal parietes. And this fact requires to be attended to, after operation as well as during the taxis, so as to facilitate replacement of the protruded parts.

The same attention to the state of the parts in judging of the propriety or not of reduction after operation, and the same after treatment, both general and local, is requisite in crural hernia as in inguinal. When the parts are reduced, the edges of the wound are brought together by means of a few stitches; a graduated compress, of proper dimensions, is applied,

and retained by a spica bandage. If this is neglected, there is a risk of the parts again descending, and on this account it is particularly necessary when the patient is unmanageable from delirium tremens, or is liable to fits. Afterwards large mild enemata are to be administered, and, after some hours, purgatives, so as to procure copious and free evacuation of the bowels. If the stomach continue unsettled, a sinapism may be applied to the epigastrium, or solid opium exhibited. Subsequently it may be necessary to bleed locally, or generally, or both ; in other cases the strength from the first requires support. After cicatrization, a well adapted truss must be constantly worn.

Umbilical hernia is generally congenital. The tendinous parietes are often deficient to a great extent, and there is consequently much fulness along the umbilical chord. The plan of embracing such tumours by ligature, as at one time extensively practised, is now abandoned, there being much risk of peritoneal inflammation and fatal issue. The surgeon is now content with reducing the hernia, and applying a truss, to prevent displacement, as in other forms of protrusion ; and if this be done in early life, and the apparatus carefully worn, the opening contracts, and the patient may ultimately be cured. The tumour may become strangulated, though rarely in the adult ; it is generally large, and almost always occurs in females. The sac has no covering but the skin and cellular tissue. A small incision is made through the sac and its investure, either on one side of the

tumour, or in the mesial line at its lower aspect. The stricture is then divided with care, the parts reduced, the wound approximated, and a compress applied. Opening the tumour throughout its whole extent is hazardous and unnecessary.

The contents of hernia are often in a very bad state, either dark-coloured throughout, or studded with dark tender spots. Often lymph is effused all over the parts, gluing them to one another, and to the sac. This effusion, which generally takes place to the greatest extent at the neck of the sac, is a wise provision made by nature against the accidents of the disease; inasmuch as a barrier is thereby formed between the cavity of the abdomen and the extruded parts, preventing, in a great measure, the destruction of the latter from affecting the abdominal viscera. For example, a portion of protruded intestine sloughs, the fæculent matter is effused, and had not this adhesion to the neck existed, the gut might have slipped back into the abdomen, its contents would have escaped there, and a fatal result would have been the inevitable consequence. Still, notwithstanding the salutary effusion, the bowel may ulcerate at its upper part, and giving way within the belly, produce rapid death. The bowel, where embraced by the stricture, is contracted and thickened, and dilated above. At the lower part of this dilatation the coats are apt to give way by ulceration, even after incision of the constricting parts. The contraction does not disappear quickly. In some cases it continues to such an extent as to keep up obstructions to the fæcal matter, and cause a fatal issue from this cause alone.

Often, on opening the sac, in long neglected cases, a discharge takes place of fœtid air and thin fœculent matter, the bowel has mortified either entirely or in patches; in the latter case, presenting the appearance of having been perforated at various points. Few constitutions can bear up under such mischief. In some, if an opening be not made, the integuments slough, and the patient, rallying after discharge from the bowel takes place, recovers after losing a portion of integument, of intestine, and perhaps of omentum. In others, and they constitute the majority, the system sinks before discharge from the bowel is effected, by sloughing of the external parts.

The surgeon is called on to operate in the worst possible circumstances, provided the patient is not in articulo mortis. Even after many days of fœculent vomiting, the bowels may be found tolerably healthy. The sac must be opened carefully, and the stricture is to be relieved without disturbing the adhesions that have formed. The bowel, when dead, or evidently moribund, is to be opened, and the discharge of fœces by the wound promoted. If returned into the abdomen, the sloughs will separate, and fœculent effusion take place, causing death in a very few hours. Sometimes the patient lingers longer than could be expected, and I have known a female survive upwards of a hundred hours after the occurrence of fœculent effusion into the abdomen. The dressing should be light, and the patient's strength must be supported in every way, by

the mouth, and by the anus when the injured part is high in the canal. The separation of the sloughs is to be encouraged. And the extent of sloughing need not dishearten the surgeon, for large portions of bowel, several feet in length, have mortified, and the patients recovered, with artificial anus, either temporary or for life.

In artificial anus, when the bowel has perished to a considerable extent, the intestine has contracted firm adhesion to the hernial sac at the opening in the abdominal parietes; through the opening in the bowel exterior to this, the fæculent matter is discharged externally, and by the adhesion is prevented from being effused into the abdominal cavity. The protruded bowel in which the sphacelation has occurred may be said to be thereby divided into an upper and an under portion,—one, the upper, discharging; the other, collapsed and empty; these lie parallel to each other, in close contact, and usually adhering, from the abdominal ring downwards, to each other, and to the hernial sac. The hernial sac seldom sloughs entirely; in almost every case its neck remains sound; to this remaining part the intestine adheres. The deficiency in the integuments and cellular tissue, through which the fæculent matter escapes, gradually contracts, and the aperture in that portion of the hernial sac which is exterior to the intestine also diminishes; but at the same time dilatation takes place in the immediate vicinity of the intestinal orifices, so that a funnel-like cavity is formed for the evacuation of fæces, extending from the opening in

the bowel to the opening in the skin—its narrowest part being at the latter situation, its most capacious surrounding the intestine. The cellular tissue intermediate between the integument and hernial sac becomes condensed, and forms a membranous lining. By this cavity an imperfect communication is established between the two portions of bowel, part of the fæculent matter returning through the lower intestinal orifice, and part escaping externally. But this communication must be indeed very imperfect at first, since the two portions of bowel lie parallel to each other, and their coalescing sides form an acute angular projection into this funnel-shaped cavity. The lower portion is necessarily much diminished in calibre, being in a great measure unaccustomed to the usual distension, and its collapsed orifice is retracted a little higher than that of the superior. On account of these circumstances fæculent matter cannot pass straight onwards from one portion of bowel to the other, but must first traverse the funnel-shaped cavity; and even then it is but a small quantity that reaches the rectum. Indeed, in most cases of artificial anus, nothing but occasional flatus passes by the original outlet for weeks or months. After some time the bowel retracts, but cannot leave the adhesion in the groin; by this retraction the orifices may be brought in a more direct line with each other, and the natural passage of the fæces be somewhat assisted.

When one or more slight patches of discolouration are observed after division of the sac, it may be re-

turned, it being most probable that the parts will recover after removal of the stricture. When any portion has given way, of course no one can contemplate reduction; and when the whole calibre has sloughed, it is absurd to attempt separation of the adhesions which must exist, dividing the external from the internal parts.

In mortification of the protruded knuckle, or part of the calibre of bowel, the symptoms are at first severe. These are vomiting, pain, and symptoms of enteritis; perhaps the bowels are obstructed for some time, but evacuation again takes place. Abscess occurs externally to the swelling, and on the giving way of the integument, matter, flatus, and thin fæces are discharged. A *fæcal fistula* remains for some time; but, by the aid of lymph and granulations, the breach in the parietes of the bowel is repaired gradually, the fæces resume their natural course, and the external opening heals.

When the whole calibre has sloughed, and even when a large extent of bowel has come away, there is still a chance of the patient recovering from the artificial anus by natural means, after the lapse of many months. As already remarked, the intestinal orifices retract, and come more into a straight line. A mucous discharge occurs from the lower bowels along with the passage of flatus, and at last part of the fæces is voided by the rectum. The discharge from the external opening diminishes, and ultimately ceases, perhaps only a minute fistula remaining, through which a few drops of fluid, sometimes fæcu-

lent, sometimes limpid, may occasionally escape. The funnel-shaped cavity previously contracts into a narrow fistula. This desirable result may be assisted and hastened by gentle pressure; and after the fæculent discharge has nearly ceased from the fistulous opening, the healing of this may be accelerated by the cautery lightly applied. It has been proposed to destroy the projecting septum between the two portions of bowel, either by ligature or by the pressure of forceps; but this should not be attempted unless nature seems unable to effect a cure. The former method consists in including a considerable part of the septum in ligature, so as to induce condensation of the parts by effusion of lymph, and destruction of the projecting portion. This has not been found successful. The application of forceps presents a more rational expectation of cure. The external opening is dilated, and the situation of the septum ascertained. One blade of metallic forceps, with blunt serrated edges,—Dupuytren's,—is passed into the one intestinal orifice, and the other into the opposite; the handles of the instrument are then approximated, locked, and fastened with a screw, and by means of the last-mentioned part of the apparatus the degree of pressure is regulated. Pain of the abdomen, furred tongue, loss of appetite, sickness, vomiting, and constitutional irritation, generally follow this proceeding, but gradually subside on the employment of enemata and fomentations, and on lessening the pressure of the forceps. The septum cannot long withstand the continued com-

pression, and by its destruction the chance of cure is greatly augmented. The proceeding is, besides, not dangerous ; for effusion of lymph takes place to a considerable extent above the part grasped by the forceps, gluing the portions of bowel firmly to each other, and forming a new barrier against any of the fæculent matter escaping inwardly. Attempts may be made to repair the loss of substance in the skin by paring the edges of the opening, and affixing a flap taken from the neighbourhood.

There is a greater chance of recovery from the inconvenience of artificial anus after hernia than after wounds. If the opening in the bowel be near the stomach, the patient will die from inanition. When it is lower in the intestinal tube, nutrition is more perfect, and the patient can be further supported by nutritive enemata. When no natural cure is likely to take place, the inconvenience will be palliated by a truss with a soft pad being worn, so as to retain the fæces till a favourable opportunity occurs for evacuation ; or a soft plug of lint may be inserted into the aperture, and retained by a compress and roller. Prolapsus of the mucous membrane of the gut sometimes takes place through the artificial anus, and is reduced with difficulty. The use of a truss or tent, already mentioned, will tend to prevent the occurrence. Great attention to cleanliness is required when the opening cannot be closed.

Operations for other kinds of hernia, if discovered during life, are to be conducted on similar principles with those for inguinal and crural. The surgeon

must be guided by his anatomical knowledge. No positive rules can be given.

In Ascites, or accumulation of fluid in the peritoneal cavity, the surgeon is not unfrequently called upon to relieve the patient, when the abdominal parietes are much distended, and the functions of the viscera of the abdomen and thorax interrupted. He must, however, exercise his own judgment in regard to the case, and convince himself of the propriety of operating. He must examine into the symptoms, and ascertain that the tumour is really caused by accumulation of fluid in the bag of the peritoneum. In ascites, the abdomen has swelled slowly and uniformly, and distinct fluctuation is felt when the hand is placed on one side of the swelling, and gentle tapping made at the other. There is considerable difficulty of breathing, uneasiness in the abdomen usually increased by pressure, thirst, and scanty secretion of urine. It ought to be remembered, that other affections have been confounded with ascites, and lamentable operative mistakes committed in consequence. Trocars have been thrust into the belly for tympanitis, either of the bowels or of the peritoneum—for solid tumours of the viscera—for enlargement of the ovaria.

As already hinted, the operation of tapping the abdomen is to be undertaken only when the distension is very great, when the functions of the thoracic and abdominal viscera are interfered with, and when diuretics, and other means of getting rid of the fluid, have failed to diminish the accumulation. The

trocar employed is either flat, with a spring-steel canula, or round; when the latter is used, and the abdominal parietes are not very tense, a small incision is first made with a lancet or bistoury; the flat enters easily, and requires no previous wound, but does not permit so rapid and free a flow. The point usually chosen for the puncture is either in the linea alba, a little below the umbilicus, the bladder being previously emptied,—a precaution which should always be attended to, though in general there is little danger of wounding this organ—or midway betwixt the superior anterior spinous process of the ilium and the umbilicus, with the view of penetrating the parietes in the linea semilunaris. The latter situation, however, can seldom be obtained with accuracy, for the parietes yield irregularly. Little bleeding follows the puncture at either point; but the risk of hæmorrhage is greater at the latter, for branches of the circumflex artery may be wounded. More serious bleeding is liable to occur, from the veins ramifying on the abdominal viscera giving way, on removal of their support, as the serum flows off. Fainting, also, may take place from accumulation in the branches of the vena portarum, unless the fluid is withdrawn slowly, and the precaution adopted of supporting the parietes with a broad band both during and after evacuation. Bandages are made for this purpose, with tapes or straps attached, and are well fitted for it. Three or four yards of flannel, however, with each end split, is equally effectual, and can always be readily obtained—a consideration of con-

sequence in the choice of all apparatus. After the band has been applied, a person is placed on each side, to tighten it gradually by steady pulling at the ends, which are carefully crossed behind. An opening is made in the cloth, opposite to where it is proposed to puncture, and the operation is then proceeded in. Sometimes the flow is impeded by the omentum or a fold of bowel falling forward on the canula, and closing or diminishing the opening ; this is remedied, by passing a tube along the canula, closed at the extremity, but perforated at the sides near it, and about half an inch longer than the canula. After the cavity has been emptied, the patient is placed recumbent, and a long broad flannel bandage applied over the whole abdomen, and retained so as to prevent shifting by straps passed over the shoulders and under the perineum.

Collections occur in the *ovaria*. The fluid is generally glairy, sometimes thick and gelatinous, often turbid and dark coloured. Not unfrequently the main cyst is subdivided, either by membranous septa, or by an aggregation of smaller cysts of the nature of hydatids. The swelling is at first on one side, and gradually rises out of the pelvis ; often it remains long movable ; it increases, becomes more fixed, and ultimately fills the abdomen, displacing the viscera, and giving rise to feelings of much uneasiness, deformity, and loss of health. The cyst is generally thick ; sometimes it is thin at one or more points, and these may give way, causing effusion of the contents into the pe-

ritoneal sac. Fluctuation is perceptible in many cases; in others, it is obscured by the thickness of the cyst and viscosity of its contents. Many such swellings may be punctured both with advantage and with safety, but generally the tapping requires frequent repetition. Some patients require tapping, merely as a mean of improving the figure and relieving uneasy feelings, once, twice, or thrice a year; their existence is not much embittered or abridged by the disease. A large round trocar is necessary for the purpose; and the puncture is made at the softest and most prominent point of the tumour, a small incision through the integument being premised.

The ovaria become enlarged by degeneration of their structure and the addition of solid matter in great abundance. The consistence and structure of such tumours are very various; they are generally of a malignant nature: often medullary, often fibrous, with or without cysts, sometimes melanotic; the simple enlargement is rare. In the majority there are cysts, varying in size, number, and contents; sometimes filled with curdy matter, sometimes with glairy colourless fluid, sometimes with a turbid and flaky serum, sometimes with blood; and in them, as well as in the enlargement from accumulated fluid, though perhaps more rarely, are occasionally found teeth, hair, and membranous looking matter; some are intermixed with bone, cartilage, and fat. The situation and attachments of such tumours cannot be correctly ascertained by examination during life, far less can their internal structure and dispositions be

arrived at. Indeed an accurate diagnosis is exceedingly difficult, if not impossible. Innumerable mistakes have been made, which have led to most unjustifiable proceedings. In one case, the abdomen was, after two or three dry tapplings, opened by an incision from the ensiform cartilage to the pubes; the viscera were turned over and over, but no tumour could be discovered. The woman was sewed up, and did not die. The following was a still more complete failure in diagnosis. In a case of large tumour of the belly, many persons accustomed to manipulate abdominal swellings considered that extrauterine conception had taken place; and that the child had come to maturity and perished. The history of the case countenanced the supposition; the symptoms had been such as indicate impregnation. The woman, to avoid exposure, went to a distance to be relieved of her burden, which was becoming more and more bulky. The usual period passed over. It was thought that the head and thorax of an infant could then be felt readily through the parietes, and perhaps some one might have been found heroic enough to have divided them and explored the tumour. The young woman, however, was in the last stage of phthisis, and soon died. A wonderfully tuberculated omentum filled the peritoneal cavity; the uterus and its appendages were quite healthy. Operation has also been proposed, when, on dissection, the liver was found to compose the abdominal swelling.

Such cases, a long list of which might be given, render the prudent surgeon very cautious in his diagnosis of abdominal tumours, and chary of operative

interference with them. The abdomen has been opened, as already stated, and the result has been such as to render the perpetrator indictable for culpable homicide, and qualify him for such punishment as his rash and reckless conduct richly deserved. A less severe censure might have sufficed, had not the example been followed by similar proceedings, and equally direful results ; and these have been such as to render any condemnatory remarks not only justifiable but absolutely necessary. A great many unfortunate women have, I am afraid, been sacrificed to a desire for false reputation. The attempts to remove abdominal tumours by incision of the parietes were some time ago very numerous, both here and elsewhere ; and, as might have been expected, the issues were highly unsatisfactory to those concerned. Such doings, however, were recorded in print, represented in plates, and moreover puffed and placarded ad nauseam. The majority of those who were thus “ dissected, to see what part was disaffected,” perished within forty-eight hours. One woman survived for some time, after having been subjected to this *operation*, improperly so termed. In her there was a tumour, but of such a size, and so connected, that it could not be removed. A second survived the extirpation of one ovarium ; and the other, also diseased, was left for a further exhibition of daring intrepidity. It is not easy to conceive how the proposal could have been seriously entertained by any sane individual, far less put in practice, when disaster after disaster crowned every attempt. It is my opinion, and I believe that I express the sentiments of a very large

portion of the profession, that the repetition of any such incisions and gropings would be unpardonable.—

1. On account of the difficulty, nay, impossibility, of forming a correct diagnosis; of ascertaining with certainty what organ is involved; of ascertaining the structure and disposition of the tumour, if any, and to what parts it is adherent. 2. Because the ovarian disease, in general, even though extensive, does not threaten imminently a fatal termination, being slow in its progress, and the greater number of the swellings being not of a malignant nature. The solid tumours are often of a bad kind, as already stated; but enlargement by fluid is much more frequent in the ovaria than that by solid and new matter. 3. If the tumour be malignant, it will be impossible to ascertain to what extent the parts are involved by the diseased action, or whether the lymphatics are affected or not. There is a strong probability of the lymphatic system being involved, even at a very early period, and then the extirpation of the tumour—supposing the mass to be so situated as to admit of removal without difficulty or danger—cannot be attended with any advantage; and in every point of view interference is unadvisable. 4. The operative attempt is attended with imminent danger. There is almost a certainty of the patient being destroyed, as shown by the sad experience of the past. “We are not the arbiters of life and death of those who apply to us for relief. If people die in consequence of disease, it cannot be helped. They submit to it because they know it is inevitable. But we had better refrain from making such experiments as may

probably destroy them, and bring disgrace upon the profession.”

Bruises of the abdomen are apt to be followed by inflammation of the contained parts, particularly of the serous membrane. Occasionally lacerations of the viscera, both solid and floating, but more frequently of the former, are produced by bruising or squeezing of the abdomen, as by a blow, or by a heavy body passing over; they may also follow violent concussion of the parts by falling from a height. The liver is the organ most frequently torn, and death is commonly the result, rapid, and principally from hæmorrhage. The laceration is generally on the convex surface; extravasation takes place under the peritoneal covering; or this is torn, and the effusion is into the abdominal cavity. When the quantity of blood is not so great as to cause speedy dissolution, the patient may survive for some time, and even ultimately recover. Reaction is slow, the patient continuing long pale, exhausted, and almost pulseless; there is tenderness in the hypogastric region, with swelling. The spleen is liable to similar injury, and pours out a large quantity of blood

The gall-bladder has sometimes been torn, as also portions of the small intestines, by a blow or kick, or by a heavy body passing over the abdomen, as the wheel of a loaded waggon. The escape of the contents is followed by sickness, rigour, quick, weak, and indistinct pulse, most excruciating pain, a sense of heat diffused all over the abdomen, and rapid sinking of the powers of life; a fatal termination

generally occurs within twelve hours. The same train of symptoms supervene when the contents of the intestinal canal have been effused into the peritoneal cavity, through an opening in the stomach or bowel, caused either by slow destruction of the coats, the peritoneum giving way last, or by a rapid ulceration or sloughing process, as in hernia. The patient may live in agony for a day or two, but death generally takes place much within twenty-four hours. All treatment is of no avail; venesection hastens the sinking. Fomentation over the abdomen, and sedatives either by the mouth or by the anus soothe the patient, and render his last moments more calm.

Penetrating wounds of the peritoneal cavity, if they reach the solid viscera and large vessels connected with them, are attended with effusion of blood externally and internally, in quantities proportioned to the size of the external aperture, the importance of the vessels concerned, and the vascularity of the part. The patient may perish from the bleeding, either instantly or after some time; or inflammation and its consequences supervene in a violent form, and destroy him at a more remote period. The inflammatory symptoms are to be combated by profuse bleeding; in short, the utmost endeavours must be made to keep the action within bounds. When the intestines are wounded, the injured part may protrude; or the relative size of the openings, through the parietes and bowel, may be such, that the intestinal contents do not escape into the peritoneal bag. A natural cure takes place by adhesion of the surface of the bowel

to the lining of the parietes round the wound, fæculent matter continuing to be discharged externally ; after a time the opening may contract, and the discharge diminish and ultimately cease ; or an artificial anus may be permanently established, and this is not so easily cured as that following hernia. Wounds of the intestines, whether transverse or longitudinal, attended with fæculent escape into the peritoneal cavity, are not uniformly fatal. Effusion of lymph takes place around, gluing the wounded bowel to the peritoneal surface of a neighbouring fold, or forming a sort of pouch within which the extravasation is limited. The treatment consists in absolute rest, and most rigid antiphlogistic regimen ; manual interference with the wounded part is not advisable.

Lumbar Abscess is generally chronic ; the collection of matter is gradual and slow. Sometimes it is acute, and rather rapid in its appearance. It usually originates in the sheath either of the psoas or of the iliacus muscle ; sometimes it seems to form behind these, or before and above the psoas. The precursory symptoms are often not particularly attended to ; they are rigours and pain of the loins. As the disease advances, the patient feels pained in the erect position, and in general the pain is aggravated by extending the thigh. Thickening and slight glandular enlargement take place in the groin ; there is an evident fulness there ; and then swelling appears on the inner side of the femoral vessels, beneath the pubal portion of the fascia lata. This swelling is

more prominent in the erect position, and is also increased by exertion of the abdominal muscles ; an impulse is given to it on coughing. As it advances, and comes more to the surface, fluctuation is perceived. This is the most common site in which the abscess presents itself ; but it is not unfrequently met with on the outside of the vessels, either lower or higher in the thigh, above Poupart's ligament, in the loins over the crest of the ilium, and occasionally the matter is insinuated under the pelvic fascia and appears by the side of the anus. Large and neglected collections may work their way to the surface in two or three of these situations.

The disease is often attributable to a sprain or wrench of the loins, or to exposure to cold and over-fatigue. Occasionally the mischief is confined entirely to the soft parts ; the vertebræ, a portion of the os innominatum, or the sacrum, may be denuded and of irregular surface, but this is evidently the result of the pressure of the abscess. A strong example of this, and of the extensive destruction of parts which this affection sometimes produces, may be shortly stated.—A very large lumbar abscess formed within a few weeks, in consequence of great and continued fatigue and exposure to bad weather. At first it had been trifled with. At last it was opened in the usual situation in the thigh, and a vast quantity of matter evacuated. Thirty-six hours afterwards, the patient was suffocated by a flow of purulent matter into and through the air passages. On dissection, the cavity was found to be immense, opening through the

diaphragm into the adherent lung, and communicating with the bronchi. The fore part of the lumbar vertebræ was exposed, and in some parts stripped of the theca; but there were no cavities in the bone, and no disease of the interposed cartilages. Such cases are now and then met with, of abscess in the loins not originating in any vice either of the bones or of any other part of the apparatus of the spinal column. Most frequently, however, the collections have their foundation in ulceration of the bodies of the vertebræ. The patient has had tenderness in the part, weakness of the back and of the lower limbs, and increase of pain on pressing or striking some particular spinous processes—perhaps slight excurvation. Then pain in extending the thigh supervenes, followed by swelling and other signs of abscess. The lumbar vertebræ are those most frequently affected, but the ulceration may also be either in the dorsal region or in the pelvis. Disease of the last lumbar vertebræ at its connexion with the sacrum, or disease of the sacrum itself, is attended with abscess around, which descends into the pelvis, displacing the bowel and appearing by the side of the buttock.

Such abscesses may have been allowed to come to the surface, and to discharge their contents spontaneously; or they may have been at a late period opened either at one point or at several. In these circumstances, the discharge is generally profuse, long continued, and attended with exhaustion and hectic, gradually but surely destroying the patient. But, by good management, a perfect and permanent

recovery may in many cases be obtained. When the vertebræ are affected, absolute rest must be enjoined and enforced ; and a drain is to be established by the sides of the spinous processes, either by moxa, potass, or seton—it is immaterial which. The discharge is kept up by occasionally dressing the issue for a few hours with an acrid ointment, so as to reproduce a slough. When the abscess begins to present, it should be opened as early as possible, and a free exit allowed to the matter ; the discharge should be at no time confined. The opening of the cavity, and again shutting it up, however carefully conducted, is in almost every instance followed by alarming and hazardous results. Rapid accumulation of putrid and bloody matter takes place, and air is extricated within the cavity ; the vessels of the cyst, being unsupported, part with their contents ; irritative fever is lighted up, with rapid pulse, anxious countenance, and delirium. These symptoms are relieved only by immediate evacuation of the fluid. Some slight constitutional disturbance follows the making of a free opening, but quickly subsides ; then the discharge improves in quality, becomes more pure and unmixed, diminishes in quantity, and gradually ceases. During the discharge the strength requires support ; and the attention to the original mischief must not be neglected or intermitted.

Spina Bifida is a congenital fluctuating tumour, with deficiency of the subjacent vertebræ. It is usually situated in the lumbar region, sometimes in the

dorsal, and sometimes over the sacrum. The size of the swelling varies according to the age of the child, and the extent of deficiency in the parietes of the spinal canal. The spinous processes are either imperfect or altogether wanting, and over the space so formed the tumour is situated. Its contents are usually of a serous character, thin and colourless; sometimes they are turbid and flaky. The parietes seem to be a continuation, or protrusion, of the membranes of the spinal chord, thickened and somewhat altered in structure, and usually in close contact with and adherent to the integuments. By pressure the size of the tumour is diminished, but, if firm or long continued, unpleasant effects are apt to result. There is often debility of the lower limbs, and the disease is not unfrequently coexistent with hydrocephalus. Children with this affection seldom live more than a few years.

The application of gentle, uniform, and continued pressure affords support to the parts, and prevents increase of the tumour; and under this palliative treatment, life may be both rendered more comfortable and prolonged. It has been proposed to combine continued pressure with occasional puncturing of the cyst by means of a fine needle, with the view of diminishing the tumour and ultimately obtaining entire obliteration of the cyst. The practice has been made trial of, and the result may warrant repetition; caution, however, is necessary, for the too free opening of the tumour often is followed by a rapidly fatal issue.

Affections of the Rectum and Neighbouring Parts.

Of Hæmorrhoids or Piles.—Piles are blind, furnishing no discharge, except a mucous or puriform fluid ; or open, pouring out a greater or less quantity of blood from time to time. They are usually of small size ; invested by the mucous membrane, thickened, congested, and consequently of a dark colour ; and either within the sphincter or projecting externally. Internally, they may sometimes consist of blood, coagulated or not, effused between the mucous and muscular coats of the intestine ; but in general their inner structure is venous, at least in the first instance. Branches of the hæmorrhoidal veins, ramifying near the inner surface of the gut, become varicose, probably from their superior trunks being compressed by hardened fæculent matter or other obstructions. The varix protrudes the superimposed mucous membrane ; and at first the excrescence is composed of the dilated venous trunks containing fluid blood, and invested by the membrane, which inflames, thickens, loses its villous character, and discharges a vitiated secretion. In this stage the tumour is easily compressible, and by pressure may be made to disappear almost entirely, the communications between the varicose vessels and the trunks above being still unobstructed. But inflammatory action is soon kindled in the incommoded veins, as

frequently happens in varix of the lower extremities; their coats become changed, are thickened, effuse lymph externally and internally, adhere to one another, and are ultimately matted into one confused and solid mass; the contained blood coagulates, becomes fibrinous, the whole tumour feels hard and firm, and often is painful. At length all traces of venous structure disappear; the tumour seems to consist chiefly of effused lymph, condensed cellular tissue, and coagula.

In not a few instances, however, the contents of the veins remain partially fluid, and a communication exists between the vessels of the tumour and those of the surrounding parts.

That such is the usual structure of piles, I am convinced from repeated and careful dissection of the tumours.

The neighbouring parts often swell and inflame. Sometimes one or two tumours exist; or they occur in numbers, clustered together, and form a large irregular mass, inflamed and often ulcerated. Acute pain is experienced in the part, when touched and after straining at stool; by straining too, such as are attached within the sphincter are pushed out, and if allowed to remain, are constricted by the sphincter, swell in consequence, ulcerate or slough, and discharge blood. The bleeding often is very violent in such cases, or when the tumour is punctured; the blood flowing in great quantity, and in a rapid stream. The hæmorrhage often is periodical, both in males and females; in the latter, it would

seem occasionally to take the place of the menstrual flux. The soft bluish tumours that are compressible, and fluctuate when large, furnish blood more readily and profusely than the hard and tuberculated.

Much irritation is produced by piles, and some of them are more irritable than others. There are often extensive excoriation of the nates around, and profuse discharge from the raw parts, particularly when the tumours are external. In such cases, flat, hard, warty excrescences often form in the cleft of the nates, and increase the irritation; these are termed *fici*, *mariscæ*, and *condylomata*.

In internal piles, a frequent desire to go to stool is induced, and more or less of the mucous coat of the rectum is protruded and swollen. The tumour, along with the protruded portion of bowel, may become strangulated if not replaced. By such, or other causes, inflammation is excited, which often extends to the neighbouring parts, and terminates in abscess; but this is not so apt to occur from tumours seated high in the rectum, as from those about the verge of the anus.

The usual cause of piles is obstruction to the return of blood in the hæmorrhoidal veins; and this may be occasioned by advanced pregnancy, habitual distension of the sigmoid flexure and rectum with hardened fæces, or tumours of the abdominal viscera. P. 78

Inflammation of the Rectum is attended with excruciating pain, burning heat, and a feeling of con-

traction, increased very much when the parts are thrown into action by evacuation of the contents of the bowel, or of the bladder. The heat may be felt on introducing the finger, with the view of examination; by doing so, dreadful torture is produced, and such manipulation should not be had recourse to unless there is a suspicion of foreign matter lodging in the part, by removal of which the action might be cut short. The bladder is often affected sympathetically; there may be frequent desire to empty it, or else retention of its contents; this latter occurrence not unfrequently follows operations on the bowel, as for the removal of hæmorrhoids. The inflammation extends to the cellular tissue round the rectum, with swelling and increased pain; the pain is aggravated by pressure, and the patient is unable to sit erect. As the painful symptoms abate, puriform discharge from the membrane of the gut takes place, and often is very profuse. The morbid action sometimes extends to the other intestines, attended after a time with mucous or even bloody evacuations. When the affection is confined to the rectum, the fæces and vitiated secretion are distinct from each other, and the former are usually of their natural appearance; but when the other intestines participate, to a greater or less extent, the fæces are fluid, and intimately mixed with the morbid secretion. *P. 80.*

Ulceration of the mucous coat, with continued discharge, often supervenes. Sometimes the peritoneal coat of the bowel is affected secondarily, and then the

pain is much more acute and more aggravated by pressure. P. 84.

Patients affected with hæmorrhoidal swellings,—the action of whose bowels is irregular, and in whom the vessels about the anus are congested,—are peculiarly liable to inflammation and abscess in the rectum or its neighbourhood, from the application of cold or wet to the surface, particularly that of the lower part of the body. Ascarides often produce violent irritation in the extremity of the rectum, both in children and in adults; and the morbid excitation is communicated to the bladder, as will afterwards be noticed. Not unfrequently the inflammation is induced by a foreign body, either lodging in the cavity of the bowel or imbedded in its coats—as hardened fæculent matter, alvine and biliary concretions, bones of small animals, needles, pins.

Effusion takes place into the loose cellular tissue round the bowel, with hard swelling, followed by unhealthy and extensive suppuration. Rigors generally precede the formation of matter, and violent fever almost always attends, abating, along with all the painful feelings, on evacuation of the fluid. Still the discharge continues, and the patient is kept uncomfortable and unhappy. Resolution can very rarely be procured; suppuration is the almost uniform termination of the action, and in persons of bad habit this sometimes occurs in these parts without any assignable cause, and without previous warning. The purulent collections are often very extensive, both externally and internally, the integuments are all

undermined, and in some cases it is difficult to ascertain the depth of the abscess, even with the aid of a long probe. *P. & I.*

Owing to the loose nature of the texture surrounding the gut, abscesses near the anus often attain a great size, and extend deeply before there is much external indication of their existence; a hardness is felt on pressing the fingers deeply by the side of the tuberosity of the ischium; this is at first obscure, but gradually becomes more developed; and at last a small dark red spot appears, indicating that the matter has approached the surface, and is most superficial at that part. But the surgeon should not wait for the pointing here, as the matter may burrow much previously, and abscess form in the substance of the sphincter, or exterior to it. If the matter does not cause ulceration of the coats of the intestine, and escape into its cavity, pointing takes place, and the pus is discharged externally, in general through a small opening. The matter is of a very offensive odour. The external aperture, and even the whole cavity of the abscess, may be at a distance from the gut, but in most cases the matter is close to it: its coats are denuded, and often ulcerated through. The surrounding degree of induration, the quantity of contained matter, the extent of the cavity, and the situation of the opening, vary almost in every instance. *P. & I.*

Cases occur of induration, often very extensive, in the neighbourhood of the anus, on one or both sides, with dark discoloration of the integuments, and burning pain. The affection resembles carbuncle. *P. & I.*

The precursory symptoms are soon followed by partial suppuration, and extensive sloughing of the cellular tissue. At first there is excitement of the system, but symptoms of debility, and flagging of the vital powers, soon present themselves—irregular pulse, delirium, disordered stomach, hiccough, vomiting, and cold extremities. The disease is one of great danger, and the patient can be saved only by free and early incision, and the judicious employment of stimulants. *K 81.*

In some instances the inflammation is merely superficial, seated merely in the integuments, and followed by slow collection of matter.

It is indeed seldom that a cavity formed by abscess near the anus fills up entirely, however large and free the opening into it may have been. The parietes contract, but the hardness around is not entirely dissipated; the opening may close for a little while, but is soon found again discharging, and may continue to do so for months or years. A sinus is thus formed. Fresh collections and openings, either externally or internally, are apt to occur, with extensive induration of the cellular tissue, and disease of the gut. Instead of a single sinus, a number of collateral ones are formed, all running into the main canal, like branches to a common sewer, or by-lanes opening into one spacious street. The disease is one of frequent occurrence amongst females; and often from a false sense of delicacy its existence is not declared till it has advanced to a state of truly horrible perfection.

Fistula is generally the consequence of abscess in the cellular substance near the anus. By the term is understood a sinus or track, with narrow orifice and hard parietes, discharging thin gleet matter. If the track extends from the cavity of the gut to the surface, flatus must often pass through the narrow and tortuous canal, and, from a peculiar noise being produced by its passage, the name of *Fistula* has probably been adopted. The term cannot be properly applied to recent cavities of abscesses, but only when their sacs have contracted, their lining has become callous, and their discharge thin and almost colourless.

The fistula may be one of three varieties—blind external, blind internal, complete. The first denoting that the sinus opens externally, but does not communicate, either at its origin or elsewhere, with the cavity of the bowel. The second, that it communicates with the bowel, but does not open externally. The last, that it both communicates with the bowel and opens externally. Some contend that fistulæ are always complete, that they commence from within, and that the internal opening is always at one particular point; but such, according to my experience, is far from being the case.

Fistulæ occur in children, though rarely; generally in people advanced in life. The cavity of the sinus, after long continuance, becomes coated with an expansion resembling mucous membrane, and secretes a discharge of mucous character.

In every case, it is necessary that the surgeon

should ascertain, as accurately as possible, the extent and nature of the fistula ; and with this view, examination with the probe is requisite. The probe is introduced into the canal, when the fistula is an external one, and directed through its windings, so as to discover its direction, length, and divarications ; the guidance of the instrument is facilitated, and the information augmented, by the forefinger being placed in the rectum. Sometimes all the by-paths cannot be detected, until the orifice of the canal is enlarged. When the fistula is complete, the probe, entered at the external extremity, can be passed into the bowel so as to be felt by the finger in the rectum ; but it must be remembered, that the internal opening is not always at the inner termination of the sinus, but often seated more externally—the cellular tissue being destroyed to a considerable extent above it, so as to form a large unhealthy abscess, communicating with the main track of the fistula. But the gut may not be opened into, though denuded to a large extent, and forming part of the walls of the sinus ; and in some instances, the sinus may not come within a considerable distance of the bowel.

An internal fistula is more difficult of detection. The symptoms leading to a suspicion of its existence are—puriform discharge from the bowel, increased on going to stool, and then accompanied with tenesmus ; pressure on the side of the anus causing pain, and sometimes an augmentation of discharge ; and in many instances hardness, deeply seated, is felt. On introducing the finger into the rectum, the aperture

in the coats of the bowel is perceived, or a part of the bowel feels more boggy and tender than the rest; through this point a curved probe, introduced along the finger, may be passed into the sinus, and being then directed downwards, reaches the outer extremity of the canal, causes the integuments to project, or is readily felt from the surface. The internal opening is usually immediately within the sphincter, seldom higher. The discharge, in general, is rather profuse, the bowel is very irritable, desire to evacuate it is frequent, and the fæces are often tinged with blood. There is a sensation of itching about the fundament, the heat of the parts is felt by the patient to be increased, he is unable to bear pressure there, and sits on one hip : in most cases the bladder sympathizes considerably. The giving way of the bowel may be produced by ulceration commencing in the mucous membrane, but is more frequently the result of inflammatory action in the surrounding cellular tissue. The aperture is the seat of acute pain when pressed upon, and during evacuation of the bowel. Great light is thrown on such cases, by the use of a proper speculum. Considerable information can be obtained by the finger ; but to the sense of touch, however acute, it is better to add that of vision. The speculum, made of silver or steel, and having its internal surface highly polished, is introduced gently into the anus, and expanded fully ; and by changing the situation of the instrument, and holding a light so as to illuminate the interior, the surface of the bowel for

five or six inches above the anus can be examined accurately, as if it were an external part of the body.

Simple indurations and contractions of the lower part of the bowel follow long-continued irritation and inflammation of its parietes. The part is a common seat of stricture, and sometimes the bowel is constricted at two or more points near each other; frequently the stricture is extensive and firm, in other cases it is narrow, consisting merely of a thin band. It is often complicated with fistula; if so, the internal aperture is immediately above the stricture, and is caused by ulceration; abscess sometimes forms above the stricture, destroys the coats of the bowel at that point, burrows around, and not unfrequently points at a far distance from its origin; or sloughing and ulceration may take place in the coats of the bowel, and fæculent matter be discharged through the opening of the abscess. In females, the vagina may be opened into in consequence of unhealthy suppuration in the cellular tissue, between that organ and the gut.

Stricture is readily ascertained by examination with the finger; but the medical practitioner must not suppose that every obstruction, however slight, to the passage of a bougie into the bowel is owing to stricture; the top of the sacrum naturally projecting forwards on the commencement of the rectum, in some degree opposes the entrance of any large body, and this circumstance is laid hold of by the unprincipled or ignorant; the patient is de-

clared to labour under stricture of the bowel, when none exists. Some practitioners discover stricture in almost every patient with disordered digestion; the whole digestive apparatus is certainly thrown into disorder by obstruction in the lower part, but this obstruction is fortunately rare. In cases of tight stricture, the bowels are distended with fæces and flatus; and if evacuation is not procured vomiting ensues, followed by enteritic symptoms, as in strangulation of the higher bowels. The gut above the stricture is always more or less dilated.

The symptoms which lead the surgeon to suspect the existence of stricture, are—difficulty in voiding the excrements; a long time occupied in the evacuation, with pain and much straining; small thin portions of fæculent matter coming away, when the matter is consistent: discharge of puriform fluid, mixed with a slimy mucus; itching and heat in the parts; and irritability of the urinary organs.

Strictures of the urethra and rectum often co-exist, as is exemplified by the following case:—A middle-aged man, when in Holland, laboured under a very deep and extensive fistula in ano. Sinuses were divided in all directions, and some healed; one, however, remained open, leading towards the gut from near the tuberosity of the ischium on the left side. He was desired to keep this open by means of bougies, which, as many were used, he manufactured himself out of cloth and plaster. On one occasion, a portion passed deeply, and could not be extracted; but his alarm at this occurrence was appeased on

being told that the foreign body would be absorbed. His condition at that time was very miserable; and inflammation was often excited in the parts, with fresh collections of matter. At the same time, he laboured under stricture of the rectum and urethra. He applied to me fifteen years after the commencement of the disease. Then the most troublesome symptom was a constant itching in the perineum, and round the anus, preventing sleep, and causing much excoriation from involuntary scratching; besides, he was annoyed by seminal emissions, and frequent desire to make water. I first divided a small internal fistula, and some time afterwards operated on a large complete one; in the latter instance, a foreign body was felt deep in the wound, the incision was extended, and a large portion of bougie, firmly impacted, was with some difficulty withdrawn. Some days after, other portions of bougie were extracted along with hairs; and these continued to be discharged for many weeks. The symptoms were much relieved. An occasional itching remained, but disappeared after the cure of a very bad stricture in the urethra. He recovered perfectly from the complication of diseases. 185.

Schirro-contracted Rectum, a malignant and truly horrible disease, may be the consequence of inflammatory action, or of neglected stricture. The neighbouring parts are involved in cartilaginous induration; the surface of the bowel is lobulated and ulcerated, its cavity is contracted, and the discharge is

profuse, sanious, bloody, and putrid; there is frequent desire to void the contents of the gut, but in general nothing but flatus and puriform fluid is evacuated; when fæces do pass, dreadful pain is excited, and continues for some time. The difficulty of voiding fæculent matter becomes greater and greater, frequent attacks of ileus occur, and in one of them the patient expires. During the progress of the disease, the functions of the bladder become disturbed; change of structure in it and in the vagina takes place; and frequently the cavities of the rectum, bladder, and vagina, are laid into one by inveterate and malignant ulceration. The affection is more common in females than in males, and rarely occurs in young persons. The countenance has the sallow hue peculiar to carcinoma, and in the advanced form of the disease becomes still more cadaverous from profuse discharge of matter and frequent hæmorrhage.

The cellular tissue, anterior to the rectum, is liable to become the seat of tumour. Malignant medullary formations occasionally form here, causing most distressing symptoms; by displacing the bowel they may obstruct its canal, and simulate stricture or schirro-contraction. *P. 86.*

Prolapsus Ani. Folds of the lower portion of the rectum are apt to protrude during evacuation, as already mentioned, in those labouring under hæmorrhoids. These are readily replaced, and the painful feelings relieved, if the attempt be made before swelling and engorgement of the vessels and cellular tissue take place. Protrusion, however, is sometimes to a

great extent; the sphincter is relaxed, and the lower part of the bowel is retained within it with difficulty; indeed there is often more of the gut without the sphincter than within it. The mucous lining becomes insensible, thickened, and white; and the patient is subject to attacks of inflammation, with additional swelling, excoriations, and ulcers of the parts. Slight protrusion is very common, and patients who have long laboured under it are in the habit of reducing the bowel after every stool, in the intervals wearing a supporting bandage. They are subject however to constant uneasiness, and more or less puriform discharge from the parts; often there is a flow of blood while at stool; health is undermined, and comfort diminished; all exertions are gone through with difficulty, and undertaken with reluctance. During exertion protrusion is almost certain to occur, and apt to be increased. The part most commonly prolapsed in time becomes hard, thick, and in a measure insensible; other and new folds appear on extraordinary straining at stool, in coughing, or any exertion of the abdominal muscles. §. 86

Tumours occasionally grow from the coats of the rectum, and are of various consistence. They may be either vascular, or deposited in consequence of increased vascular action, and afterwards increased by addition of solid matter. They are to be removed either by ligature or incision, according to their situation, nature, and attachments.

Foreign bodies may lodge in the rectum—as bones, portions of hard indigestible meat, &c., introduced by

the mouth—or clyster pipes, bougies, &c., which have passed up per anum. By being the source of constant irritation, and obstructing the functions of the part, they demand removal. Alvine concretions are now rare; they are usually situated in the caput cæcum coli, sometimes in the sigmoid flexure, or in the arch of the colon; they may descend into the rectum, and lodge there.

Children are sometimes born with the anus *imperforate*, the extremity of the rectum being covered merely by integument, or the bowel terminating an inch or two above the usual site of the anus; or the rectum may be wholly deficient. In the last case, the colon may end in a blind sac at the fundus of the bladder, or it may open either into that viscus or into the vagina. *P. 87*

Treatment of Affections of the Rectum.—In the treatment of hæmorrhoids, the cause should be removed if possible; and this may suffice for the cure. When the tumours are recent and small, they may be made to disappear by the use of astringent ointments or decoctions, as of galls, kino, oak-bark, and by sedulous attention to cleanliness of the part. In inflamed tumours, blood may be abstracted by leeches or punctures, and hot fomentations afterwards used. When constriction by the sphincter has occurred, the tumour should be replaced if possible. In irritability of the sphincter, a bougie is sometimes used with advantage; and incision of the muscle, by which rest is afforded to the parts, will often effect a cure, after the failure of all other means; the division

may be either partial or complete, as the case may seem to require. In most cases, the tumour can be got rid of only by the knife or ligature. When the piles are internal, removal by ligature is to be preferred; the patient being made to strain, and thereby bring the tumours as low as possible, a ligature is placed round the base of the swelling, provided its form conveniently admits of it; otherwise the base is pierced by a fixed needle armed with a double ligature, the separate portions of which are applied tightly to the corresponding parts of the base. Before proceeding to this measure, the bowels should be emptied by mild and repeated purgatives, and afterwards all stimuli should be avoided. It is imprudent to apply ligature to several tumours at once, for serious consequences will most probably ensue, inflammation of the bowel, obstinate constipation, and general excitement. Excision of such piles is contraindicated by the risk of profuse hæmorrhage. The bleeding is into the cavity of the bowel, a coagulum is there formed which encourages the flow; and from this cause, and the peculiar situation of the bleeding point, it is with difficulty arrested. When the tumours are external, ligature may be adopted; but here there is no objection to the use of the knife, and excision is less painful and more speedy. The tumours, along with protruded portions of the mucous lining of the rectum that cannot be reduced, and are changed in structure and function, are readily taken away by the rapid stroke of sharp curved scissors. Or they may be laid hold of and stretched, and their base divided by one or more sweeps of a bistoury or

scalpel. Should hæmorrhage occur, the surgeon has it completely under command, since it proceeds from a superficial part. Pressure by a large graduated compress is generally sufficient.

In inflammation of the rectum, the exciting cause often is not discovered ; when detected it should be removed without delay. In simple inflammation of the part with violent fever, general bleeding may be required ; and in all cases blood should be abstracted locally and freely. Leeches are to be applied to the verge of the anus, and the lower part of the perineum, and hot fomentations afterwards used. Internal antiphlogistics are at the same time not to be neglected. In retention of urine, or great irritation of the bladder, in consequence of the affection of the rectum, the perineum should be leeches and fomented, perhaps also the lower part of the abdomen ; the catheter should be avoided if possible. When induration takes place in the cellular tissue by the side of the anus, or in the perineum, suppuration must in all probability occur, and poultices with occasional fomentation are to be used, though only for a short time ; for, as already mentioned, pointing of the matter is not to be waited for in this situation ; incision must be had recourse to early, in order to prevent bad consequences. Leeching is sometimes used here, as in purulent formations in other parts, from gross ignorance of the real state of matters ; and sometimes their use is continued after fluctuation is distinct, and until the pus begins to ooze through the leech-bites ; such is very useless and very dangerous practice ; in most cases the internal parts are

extensively destroyed before the matter comes spontaneously to the surface.

In the carbunculous state of the cellular tissue, near the rectum, with extensive infiltration, dark integument, and a tendency to sloughing, an early and free opening must be made wherever matter is suspected to have formed, however deeply seated, and in whatever quantity, and whether the parts are indurated or not; nothing but mischief can result from delay. When the cellular substance is destroyed, the incision must be proportionally extensive, to afford a free exit for slough as well as matter. During the suppurative cure, the system will require good support, and most probably a free administration of stimuli.

It has been recommended that, in abscess extending along the gut, the cavities of the bowel and abscess should be at once laid into one by incision. I have done so, but always found the cure to be tedious. It is better that the matter should first be evacuated through an external opening, that the painful symptoms and constitutional disturbance should be allowed to subside; and that after the cavity has contracted, and the extent of the sinus been ascertained, the operation should be performed. In the operation the knife is now used; but in former times the ligature and cautery were in employ. The old surgeons supposed that there was something malignant in the hardness and callosity attending this disease, and were not contented with opening the

cavities, but endeavoured to dissect out the whole parts; and if foiled in this, they finished the work with the red-hot iron. Indeed the practice of excision was recently in vogue at Paris. But the operation for fistula has been much simplified. The bowel is generally so much separated from its connexions, as to be incapable of again adhering, or of furnishing granulations; and though capable, healing is effectually prevented by the frequent motion of the parts caused by the action of the sphincter and levator of the anus. One side of the cavity is fixed, whilst the other is in motion. It becomes necessary to lay the cavities of the bowel and of the fistula into one. This can generally be effected with great ease; a salutary degree of excitement follows the use of the knife, rest to the parts is procured, the edges are allowed to retract and adhere to the opposite surface, and the wound heals quickly from the bottom. The surgeon, in his operative procedure on these parts, must use both hands equally well, otherwise the patient must vary his position, and be often put in a very awkward predicament, more particularly if a female. The patient is placed in a stooping posture, with the legs unbent, and the fundament turned towards the light. The surgeon inserts the finger, well soaped and oiled, into the rectum, and with the other hand insinuates a curved probe-pointed bistoury into the sinus, using the instrument merely as a probe. Having reached the extreme depth of the canal, the direction of the instrument's point is changed so as to apply its cutting

surface to the coats of the bowel, at that part. The instrument on being thus passed into the bowel is fixed by the finger, and by drawing both outwards, the coats of the bowel and the parts intervening between them and the sinus are divided. All collateral sinuses extending towards the perineum and hip must be freely divided, for they cannot be expected to contract otherwise. Such is all that is necessary in the generality of cases ; but it is evident that the steps of the operation, and the extent and number of incisions, must be varied according to circumstances. A great part of the affected bowel may be pulled down by a director before being cut, as is sometimes done ; but the practice is useless and painful. Should hæmorrhage take place, it may be restrained by stuffing the wound gently with lint ; if this fail, the bleeding vessels are to be secured by ligature ; but this is seldom necessary. The bowels should be well cleared out before the operation, so that two or more days may pass over without the parts being required to perform their functions ; and if the bowels are naturally loose, opiates may be administered. Afterwards copious evacuation is to be procured by enemata or gentle laxatives. It is necessary to prevent the external part of the wound from adhering, until the whole has contracted equally, and begun to be filled up by granulations from the bottom ; and with this view a piece of lint is interposed between the margins. Stuffing the wound daily with large dossils of lint is attended with much pain, and impedes the cure. The dressing should be simple and

light, and introduced with gentleness and care. The first should be allowed to remain undisturbed till spontaneously discharged along with the fæculent matter. In the greater number of cases, a second interposition of dressing is all that is required. In all cases, dressing should not be continued long; but as the cavity gradually contracts, discharging laudable pus, and becoming coated with healthy florid granulations, the interposed pledgets should be daily diminished, and soon omitted entirely. If the surgeon continue long to stuff the wound it cannot contract, will become callous as before, and a fistula will be reproduced. Injections into the wound, or the application of lint soaked in a gently stimulating lotion, are often beneficial in promoting contraction. But, as already stated, most fistulæ get well after proper incision, with but one dressing, and without any after application excepting plenty of soap and water. During the cure, the general health must be kept vigorous, and the state of the bowels strictly attended to.

In ulcer of the mucous lining, with irritability of action in the bowel, injections of tepid or cold water are useful, by removing irritating matters from the part. By means of a speculum ani the ulcer can be readily exposed; it may be touched occasionally with the nitrate of silver, in substance or solution, or, if indolent, with a solution of the muriate of mercury. When the irritation is very great, and the lower part of the bowel frequently in a state of spasmodic action, the sphincter may be divided so as to allow the parts to remain quiet; and ano-

dyne suppositories or soothing enemata will then be used with much greater advantage than previously. To obtain reparation of breach of structure in any part, rest is a principal part of the treatment ; and in the case of the rectum and other mucous canals it is pre-eminently required.

Strictures of the rectum are treated by bougies of wood, plaster, or elastic gum, introduced at intervals, and gradually enlarged. The bougie should be smooth in the surface, and rounded at the point ; also slightly curved, so as to suit the figure of the bowel ; and with a narrow neck, so as to remain without the irritation caused by distension of the sphincter. At first it should be of such a size as can without much difficulty be pushed past the stricture, and as this relaxes, the size of the instrument must be proportionally increased till it completely fills the bowel when dilated to the natural calibre. The bougie may at each time be retained from a quarter of an hour to an hour, according to the feelings of the patient. Suppositories and enemata are at the same time employed ; the latter to clear out the lower bowels, the former to allay the irritation which accompanies the disease, and which may be increased temporarily by the bougies. When the stricture is callous, and will not yield by dilatation, it may be divided with the knife ; and when the parts have begun to granulate, recourse to the bougie will soon effect a cure. When fistula and stricture co-exist, both are got rid of at once by the usual operation for

the former, and by the after treatment peculiar to each.

In malignant contractions of the gut, all that can be done is to palliate the disease by anodynes, administered by the mouth, or applied topically. Injections, bland, and occasionally anodyne, tend to diminish irritation; bougies aggravate the disease. At the commencement, the diseased parts may be removed by the knife or by ligature, and relief and exemption follow, at least for a time; but no operation is warrantable in this or any other cancerous affection, when the morbid action has gained ground, and the disease is extensive. Female patients have by some been cruelly treated; the vagina and diseased bowel have been laid into one loathsome cavity, and though the patients have continued to pass excrement and discharge through this cloaca, with the symptoms undiminished, themselves miserable and obnoxious to others—still such cases have been reported as cures!

In prolapsus ani, the protruded parts are to be carefully reduced, and kept so by means of a compress supported by a T bandage; often a spring with a pad is used with advantage. In inflamed prolapsus, with ulceration of the mucous coat, the patient is confined to the recumbent posture, and soothing applications employed, and when thus the irritation has been removed, reduction is performed; but the bowel seldom remains up till after the ulcerations have been healed. In chronic obstinate cases, the prolapsed and altered parts are removed by the knife with safe-

ty ; contraction attends the cicatrisation, and so further protrusion is prevented.

By the speculum ani assisting the eye and finger, the nature and position of foreign bodies in the rectum are ascertained, and their removal facilitated. They are to be extracted by the finger, by a scoop, or by forceps. It has been proposed by cut into the colon from behind, so as to open that part of the bowel unconnected with the peritoneum, when it is distinctly ascertained that alvine concretions lodge there. This may be put in practice when the case is clear and the symptoms urgent, but, as already observed, such foreign bodies are now very rarely met with.

In imperforate anus, when the bowel terminates high, it has been proposed to cut through the abdominal parietes, and open the sigmoid flexure, so as to establish an artificial anus. The proceeding is unwarrantable, both in congenital deficiency and in malignant disease of the bowel. There is no doubt a possibility of life being thus prolonged, but it is by no means probable, and scarcely desirable. In the more common cases, the bowel is opened, and the meconium evacuated, by a slight and safe incision in the site of the anus. Even through a considerable depth of soft parts the impulse of the fluid in the bowel is distinctly felt during exertion of the abdominal muscles. If incision through the integuments and cellular tissue prove insufficient, a sharp-pointed bistoury is pushed onwards in the direction of the bowel, under the guidance of the forefinger of the

left hand, carefully avoiding the bladder, vagina, and uterus, as also the vessels within the pelvis. To reach the bowel is an object of great consequence, yet the risk incurred in its accomplishment must be considered, and the incisions limited. In some cases the opening requires to be kept pervious by the use of proper bougies, but, in general, the functions of the parts are sufficient for the establishment of the anus.

Affections of the Mucous Membranes of the Urinary and Genital Organs.—It has been previously observed, that these membranes closely sympathize with the skin and with the mucous lining of the digestive organs. Stimulating substances introduced into the stomach frequently produce irritation of the urinary organs; and if the stimulants be employed in large quantities, and continued for some time, inflammation of the mucous membrane, investing the bladder and urethra, will be induced, with vitiated and increased secretion from the parts. In children, dentition is a common cause of urinal irritation; and not unfrequently discharge from the urethra comes on during the cutting of the teeth. The application of acrid matters, as cantharides, to the skin, will occasion unpleasant effects in the urinary organs. In short, the practitioner, in attending to affections of these parts, must ever bear in mind the close sympathy which exists between them and the external surface, the stomach, and the intestines, particularly the lower.

Of Gonorrhœa, or inflammation of the Urethra.—The morbid action is usually limited to the extremity of the canal, seldom extending more than two or three inches from the orifice. There is itching and heat at the orifice, with swelling and redness of the glans, and of the lips of the urethra, and generally the whole penis appears more full than natural. When making water, the patient experiences acute heat and pain, often most agonizing—chiefly referable to the extremity of the passage, and extending for two or three inches backwards. The urine is discharged in a small and scattered stream, the anterior part of the urethra being diminished in calibre by the swollen and turgid state of its lining membrane. The diminution may be in part caused by spasm of the canal, in consequence of the morbid excitement in it; or by fear, as the patient dreads making water, well knowing the excruciating pain which he must in consequence undergo. During erection, there is great increase of pain. The lips of the urethra, and the glans around, are often tender, and partially excoriated through neglect of ablution. There is seldom, if ever, any breach of structure in the canal; there is discharge of increased and vitiated secretion, without ulceration or absorption; the matter is poured out from the relaxed, but entire, mucous membrane.

In severe cases, the erections are abnormal, and attended with much pain, constituting *chordee*. This troublesome symptom usually occurs during the night; the inflamed membrane is stretched, and great pain is felt along the course of the urethra. From extension

of the inflammation to the vascular tissue around the canal, and effusion of lymph into it, the penis is bent downwards during erection, the corpus spongiosum not admitting of so complete distension as the corpora cavernosa. Sometimes a portion of the spongy body is obliterated permanently by the effusion, causing deformity of the organ, and imperfect erection. I have also seen the penis bent to an inconvenient extent from a similar affection of the corpora cavernosa.

After the uneasy and painful sensations have continued for some time, puriform matter, of a greenish or yellow colour, is secreted by the inflamed membrane, and discharged in profusion. The discharge changes very much as to quantity and quality, according to the intensity of the action and duration of the disease, and is also modified by the constitution of the individual. When the discharge is suppressed, either from the imprudence of the individual, or from bad treatment, the inflammation is much increased; and when the secretion returns, it is in general thin and bloody. As the disease abates, the matter becomes thick, ropy, and less abundant, is seen only in the morning, and in quantity little more than sufficient to glue together the lips of the orifice; ultimately it loses its whitish or streaked appearance, becoming clear and colourless. The first attack of the disease is generally the most severe.

In neglected cases the prepuce swells, often to a great size. During the progress of the Gonorrhœa there is always a tendency to serous infiltration in the prepuce; and if the patient walk much without

supporting the organ, or have the part exposed to friction, swelling will inevitably take place. From this cause Phymosis and Paraphymosis are apt to occur —affections that will be afterwards described. From the same cause the inguinal glands often enlarge, but such swelling is generally small and seldom suppurates.

Induration and enlargement sometimes occur along the urethra from effusion of lymph, or from obstruction and distension of the lacunæ. Suppuration may take place at these points, and the matter escape either into the urethra or externally. Swelling of the lymphatics of the penis is by no means uncommon in severe or neglected cases of gonorrhœa; a hard chord, tender, and extremely painful when pressed, is felt running along the dorsum penis, and terminates in the inguinal cluster of glands, which are in general also affected. Inflammation and abscess under the strong tendinous sheath that envelopes the penis occasionally follows the affection of the lymphatics. The whole penis swells greatly, with fever and much pain; the matter is confined, burrows under the unyielding sheath, and appears either at the junction of the glans and prepuce, or over the symphysis pubis.

Occasionally the inflammation is not confined to the extremity of the urethra, but pervades its whole extent, in consequence of maltreatment, neglect, or idiosyncrasy. On this account, abscess in the perineum, or over that part of the urethra which is covered by the scrotum, is no uncommon consequence of a badly managed clap; the inflammatory action

extending from the urethra to the cellular texture exterior to it. The formation of matter is preceded by fever and great pain; the patient is unable to sit; and occasionally retention of urine takes place. The part affected feels hard, and extremely painful when pressed; it gradually softens, and at last fluctuates and points. But if the matter form deeply, behind the bulb and in the cellular texture beneath the perineal fascia, or in the situation of Cowper's glands, it may be long of appearing externally. Fluctuation should never be waited for; and in most cases there are distinct enough signs of the presence of matter long before fluctuation can be felt.

Some people are much more liable to inflammation of the urethra than others, and many are exposed to the ordinary causes of gonorrhœa without suffering, whilst perhaps they are readily affected by such animal poisons as produce disease of the prepuce and glans. Patients often give very ridiculous accounts of the way in which their clap was contracted. They will say that the infection was received in a common necessary, that the disease was produced by a blow, by a strain of the back, by taking drugs that did not agree with them, by drinking out of the same cup or smoking the same pipe with an infected person, by wearing tight boots, falling into a dirty pond, &c. They will exert their ingenuity to the utmost in order to deceive their surgeon, and attempt preserving their moral character untainted. Discharge from the urethra may be occasioned by dentition, &c. as already mentioned; or may take place from calculi

passing along and getting fixed in the urethra, or from irritations about the anus. The most common cause, however, is the application of irritating matter to the lining membrane; and this may take place during coition with females suffering from leucorrhœa, or during their menstrual discharge; but gonorrhœal matter is the specific virus, and the application of it to the orifice of the urethra is by far the most frequent cause of inflammation of the canal. Irritating substances injected into the passage, may, and often do, produce or aggravate the inflammatory action. Besides all this, irritability of the urethra is common in gouty individuals.

Gonorrhœa has been termed virulent when caused by gonorrhœal infection—simple, when induced by irritations such as those previously enumerated; the distinction is seldom attended to, and is of no practical importance. It has been supposed that the poison which produces chancre is the same with that which gives rise to gonorrhœa, the action being modified by the texture in which the virus is lodged: such an opinion has been found to be wholly untenable.

Gonorrhœa supervenes at various periods after exposure to the infection, from twenty-four hours to six or eight weeks, but generally in from ten to twenty days; often the time cannot be correctly ascertained; much depends on the idiosyncratic susceptibility of the urethra, on the degree of acridity in the matter applied, and other contingent circumstances.

When the discharge becomes more clear and thin, and the inflammatory symptoms have disappeared, the disease is termed *Gleet*. The passage remains contracted in some degree, from relaxation of the mucous surface; there is a desire to make water more frequently than usual, and the urine is passed in a tortuous or scattered stream; in many cases the discharge continues profuse. There is now no pain nor scalding during the passage of urine, but these are readily reinduced by slight excess; perhaps there is a trifling chordee. After connexion the discharge returns as if fresh infection had been caught, though such be not the case; both in simple gleet, and in that attending stricture, the seemingly virulent symptoms come on speedily, often appearing within a few hours after the coitus. In gleet the matter is no longer green or yellow, but whitish and flaky; the globules are contained in a mucous instead of a serous fluid. The disease is usually attendant on stricture, but occurs frequently without any organized contraction, the discharge being furnished by the vessels of the surface, which have become weak and relaxed in consequence of previous excited action. In feeble constitutions, inflammation of the urethra is almost always followed by long-continued and intractable discharge.

A practitioner is not unfrequently asked when the infection of gonorrhœa is not communicable, and if an individual in whom the discharge is very slight, or has just disappeared, is likely to contaminate a healthy female. The question is a difficult one to an-

swer. In general it is prudent to err, if at all, on the safe side—by expressing doubts, and dissuading from intercourse until all discharge shall have entirely ceased for a considerable time. Discharge is often brought back, as already observed, by the excitement of sexual connexion.

In simple inflammation of the urethra, with discharge, little or no treatment is required; if the patient keep quiet and avoid the causes which gave rise to the affection, the symptoms will disappear in a short time. But virulent gonorrhœa is often very unmanageable, particularly if it has been allowed to follow its own course, and consequently to make head before it is attacked. It is no easy matter to arrest it after the parts have got into the habit of furnishing discharge, and particularly if it has been aggravated by thoughtlessness and imprudence of the patient. All exercise, more particularly violent, should be avoided, as also indulgence in venery and liquors. A great variety of remedies, both external and internal, have been employed. General bleeding has been recommended, but never can be required in simple clap. If the bladder, or other important organ, become affected, depletion will be indispensable. Abstraction of blood by leeches from the perineum may be required, when from any cause the inflammation extends beyond its usual seat; and great relief is afforded by afterwards employing hot fomentations, or the bidet, and by diaphoretics given internally. Mercury was used in clap by those who conscientiously believed that the disease was the same as

what they called syphilis. But it had been better far for mankind had such a term, or the notions associated with it, never been broached; or at least had mercury never been considered as necessary for the cure of affections of the genital organs. In gonorrhœa mercury may do much harm; it never can do good. The disease has often been contracted, whilst the system was saturated with the mineral. Frequent and violent purgings with neutral salts—a common plan of treatment amongst the unprofessional and inexperienced—are hurtful; the extremity of the rectum is irritated, and may inflame, and the urethra, from intimate sympathy, will suffer accordingly. Common turpentine, copaivi, cubeb, buchu, &c. have been long employed in all forms of the disease; of these, copaivi, administered from the first, and not after the inflammatory symptoms have subsided, is perhaps the one chiefly to be relied on. It may be taken pure, with a little water, or mixed with an equal part of honey; it should be given at bedtime, and in a large dose, from a drachm to two drachms. The medicine may with prudence be continued after the disappearance of the discharge, though its beneficial effects are scarcely observable, excepting during the inflammatory stage. An unpleasant eruption, resembling urticaria, sometimes follows its employment; it appears on the inside of the lips, and on the glans penis, and if the drug is continued, the eruption spreads over the whole surface. Cubeb, though somewhat similar to copaivi in its virtues, often disappoints the practitioner. This class of

remedies, instead of stimulating, diminish greatly the irritation in the urethra or the other parts of the urinary organs. In severe cases it is of importance to increase the quantity of urine, and thereby diminish its acrimony, by the free employment of diluents and mucilaginous drinks; on this principle *infusum lini*, containing more or less of nitrous æther, is very efficacious. The patient suffers much when the urine is scanty, and contains a large proportion of saline particles. Rest and moderate diet are of paramount importance as means of cure. Support of the penis, by a suspensory bandage, or otherwise, should always be attended to when the patient takes exercise, for many bad consequences will thereby be avoided; indeed it is a measure requisite in all affections of the organ, and particularly in gonorrhœa—when the prepuce, or even the whole penis, is liable to swell enormously. Its propriety has been long known; one of the fathers of surgery has said, “*Sursumque coles ad ventrem deligandus est, quod in omni curatione ejus necessarium.*” By low diet, and the frequent use of warm bathing, of the part, or of the whole surface, the disease often disappears rapidly; but when the cure is supposed complete, a few glasses of wine and a hearty meal will suffice to bring it back with all the violent symptoms.

Cooling washes applied externally to the penis are of little use, and will seldom be long submitted to by the patient. Fluids injected into the urethra, so as to be applied to the affected part of the mucous mem-

brane, are much more efficacious. When stimulating, the relaxed membrane is astringed, the action in the part is changed, and a healthy secretion ensues; such are applicable after the inflammatory symptoms have subsided. But in many instances astringent injections are of much service from the very commencement; the morbid action seeming to be arrested, and the parts quickly brought into a healthy condition. Yet the use of such is not unaccompanied with risk, and the mildest are sometimes hurtful; the incited action is apt to extend along the passage; the discharge may be suddenly suppressed, and inflammation of the bladder or testicle will generally supervene; in short, the prominent symptom, discharge, may be arrested, but at the same time such violent inflammatory action may be induced as will be followed by change of structure in the canal, callosities, contractions, abscess, &c. The injections may be composed of *nitras argenti*, *sulphas cupri*, *sulphas ferri*, *sulphas zinci*, *acetas zinci*, *sulphas aluminæ*, *urias hydrargyri*, in the proportion of a very few grains to the ounce of distilled water, or the astringents may be vegetable, as *kino*, *galls*, &c.; their strength may be gradually increased according to their effects. They are injected by means of either a small syringe or an elastic bottle fitted with an ivory tube, the point being smooth and rounded. This is carefully introduced into the orifice of the urethra, and the patient is recommended to press on the canal with his finger to prevent the fluid from passing farther than an inch

or two. It may be thrown in two, three, four, or five times during the day, according to circumstances, and retained for a few minutes; at each time the patient should make water immediately before. The quantity injected at one time should not exceed a teaspoonful; more is unnecessary, and may do harm. By passing bougies or other instruments along the canal during active inflammation, much mischief is done. When excitement has gone off, and discharge remains, advantage may be obtained by the internal administration of lytta or other stimulants. When contraction of the passage is suspected, or when, in spite of all means, no progress is made towards a cure, slight discharge continuing long without pain, and probably furnished by a relaxed portion of the membrane, recourse must be had to the occasional introduction of a full-sized bougie. Cold bathing, local or general, is sometimes useful.

If during the violent symptoms the discharge be from any cause suddenly suppressed, inflammation of the bladder, swelled testicle, or both, are to be dreaded; and endeavours should be made without delay to procure its return, as by leeching the perineum, fomentations, and the general warm bath.

The Consequences of Gonorrhœa occur in parts closely connected with the urethra by sympathy and function; or they are such as affect the constitution.

Of Hernia Humoralis, or swelled testicle. Pain and swelling occur in the epididymis, and soon affect the body of the testicle. The pain is most excrucia-

ting, the unyielding nature of the tunica albuginea preventing the vessels from relieving themselves fully, and inducing compression of the enlarging organ. Effusion takes place into the cavity of the tunica vaginalis, and thereby the tumescence is still more increased, this tunic from its great dilatibility readily accommodating itself to the accumulation of fluid within. Sometimes the effusion is bloody, more generally serous, and not unfrequently composed of serum more or less tinged with blood. The epididymis remains enlarged longer than any other part, often during the remainder of life. Sickness, vomiting, and violent fever, attend the progress of the swelling. Pain in the lower part of the abdomen is not unfrequent, and may be mistaken and treated for enteritis. The spermatic chord becomes enlarged and tender. The pain is much increased when the patient assumes the erect posture, from the enlarged and pendulous gland stretching the inflamed chord. Uneasy feelings are complained of in the back, and pain there is sometimes so acute as to be compared by the patient to the sawing of his loins asunder. When the inflammation is violent, and effusion into the substance of the gland extensive, suppuration may occur; and in infirm constitutions this is not an unfrequent, though remote, consequence of hernia humoralis. The testicle is said to be rendered useless by the supervention of this disease. Certainly it is in danger of having its functions destroyed when the incited action is intense and the effusion great, and particularly if suppuration

follow. The disease may be induced by violent exercise during inflammation of the urethra, bruising of the organ, suppression of gonorrhœal discharge, the imprudent introduction of bougies, the use of strong urethral injections, or debauchery of any kind, during inflammatory gonorrhœa.

In the treatment, complete rest occupies a prominent station. The inflamed organ must be supported; and all means which may have been employed with the view of checking gonorrhœal discharge must be abandoned. General bleeding may be necessary when the system is much excited; and in all severe cases blood should be abstracted copiously from the part, by the application of leeches or the opening of a scrotal vein, and the organ is afterwards to be fomented for some time, and then enveloped in a warm poultice. The bowels must be kept open, the diet must be very low, and the value of antimonial medicines as a powerful remedy in all inflammatory affections must not be overlooked. Cold applications are of little or no service at any period of the disease, and frictions with mercury and camphor had better be dispensed with. When the violent symptoms have subsided, bathing the part with a tepid solution of the murias ammoniæ is often useful; or it may be rubbed gently with diluted iodine, or with a liniment of soap and camphor. Much relief is experienced from interposing between the scrotum and suspensory bandage a soap plaster, or one composed of equal parts of gum and mercurial plasters; thereby the organ is defended from irritating friction and mo-

tion, and slight stimulation is produced and kept up. Blisters promote discussion if the swelling become indolent, but are very annoying to the patient. They require repetition, but generally are in the end effectual; perhaps the rest necessary during their use is of as much benefit as the application.

Inflammation of the Bladder and posterior part of the Urethra, may arise from other causes than suppressed or badly treated gonorrhœa; but, however induced, its symptoms and consequences are the same. The presence of calculi or other foreign bodies, over-distension, &c. will be treated of hereafter, as causing irritation and inflammation of the viscus. Much vesical irritation is often produced and kept up by disease of the kidney.

When inflammation of the bladder is slight, it is attended by uneasy feelings referred to the perineum, pelvis, and glans penis; frequent desire to empty the organ; pain felt acutely before evacuation of the urine, and relieved immediately afterwards; scanty secretion of acrid and highly coloured urine; a discharge of slimy tenacious mucus, either pure or voided along with the urine. In severe cases, most excruciating pain is experienced during the discharge of the contents of the bladder. The urine is often bloody; in general it is of a milky appearance, containing lymph or puriform matter, and vitiated secretion from the lining membrane. Micturition is almost constant, small quantities being voided at a time. Sometimes the inflammation extends to the

ureters and pelves of the kidneys, causing violent pains in the loins, nausea, occasional vomiting, and colicky affections.

In very violent cases lymph is effused on the inner surface of the bladder, and may become organised ; but such effusion is rare. I met with one remarkable instance of it in my own practice, and have seen several others. An old pensioner fell from a scaffolding, during his late Majesty's visit to this city. He sustained a severe contusion of the back, and retention of urine came on ; his urine was drawn off regularly for some weeks, but then severe pelvic symptoms supervened, and at last nothing but a small quantity of purulent matter flowed through the catheter. The symptoms became urgent, the bladder was very much distended, and rose to the umbilicus ; all endeavours to evacuate the urine per urethram failed, the instrument being always closed by thick pus, and I was obliged to open the bladder above the pubes. Much purulent matter mixed with fœtid urine escaped from the wound, as also a false membrane which invested the mucous coat of the viscus. The membrane was of a flocculent appearance, in some places distinctly fibrous, in others thin and transparent ; and its internal surface was irregular, as if from the deposition of minute granules of recent lymph. The patient died exhausted, after having survived about three weeks, voiding his urine partly by the wound, and partly per urethram. It should perhaps be mentioned, that those who saw him immediately after the accident supposed that

blood was extensively effused into the bladder, and attempted to extract the suspected extravasation by means of an exhausting syringe through a catheter, probably not passed into the bladder.

Occasionally, though rarely, the inflammation extends to the peritoneal covering of the bladder, and thence to the external surface of the intestines.

The bladder becomes thickened, and lymph is effused between its coats, from repeated attacks of inflammation, or from long continued irritation in consequence of resistance to the expulsion of its contents. The mucous membrane is thickened, relaxed, and of a flocculent appearance; the fibres of the muscular coat are enlarged, and bulging out, form projections along their course; the mucous follicles are expanded; and depressions, often of large size, are formed between the projections of the enlarged muscular fasciculi. The cavity of the organ is generally diminished in proportion to the thickening of its parietes, and there is a loss of balance betwixt the retaining and expelling powers.

Irritable bladder is generally a symptom of some other affection. There is profuse mucous discharge; micturition; pain, increased by distention of the organ, and relieved by evacuation. The coats are more vascular than naturally; sometimes the muscular is strengthened, and ulceration of the mucous membrane is not unfrequent. Occasionally this latter tunic is the seat of tumour.

In the treatment of inflammation of the bladder, after removal of its causes, antiphlogistic means

occupy a prominent situation, and are to be regulated according to circumstances. Leeches to the perineum and hypogastrium—soothing injections into the rectum—opium or hyoscyamus, either by the mouth or in the form of suppository—fomentation and the warm bath—are all valuable remedies in this affection. When injections into the rectum are used, their bulk should not exceed three or four ounces, and they should contain from fifty to a hundred drops of laudanum, or a less proportion of the liquor opii sedativus. But an anodyne suppository is perhaps more simple and more efficacious, composed of from two to five grains of opium with ten or fifteen of hyoscyamus. Its effects are almost instantaneous; all pain goes off; the patient becomes quiet, loses all recollection of his former sufferings, and often remains in a state of enviable comfort for twelve or sixteen hours. The suppository may be repeated as need be; the preferable time for its exhibition is the hour of sleep. Camphor, given by the mouth in large doses, is a powerful remedy for allaying irritation of the bladder, from whatever causes induced; as is copaivi, less nauseous and more trustworthy than cubebs or buchu. The copaivi will often remove speedily the most intense irritation, when all other means have failed. The bowels are to be kept gently open, and all stimuli disused; diet should be low, drink copious and bland. Washing out the bladder with anodyne or other fluids, and the application of blisters to the perineum and neigh-

bouring parts, have been recommended, but are more injurious than useful.

Of Stricture of the Urethra.—By stricture is understood a narrowing or contraction of a mucous canal, from deranged action, or from morbid alteration of its structure. It may arise from relaxation and turgescence of the parietes, or from effusion of lymph either under the lining membrane, or on its surface. Spasmodic stricture has been spoken of by some writers, but is most probably an imaginary disease. An irritable urethra, in which organic disease does not exist to any great extent, may contract at various points, diminish the stream of urine, and prevent the introduction of instruments, or retain them by closing firmly round, and in such circumstances the obstruction does probably depend on spasm of the muscular fibres of the urethra; yet to such a state of the canal the term stricture cannot be applied with any degree of propriety.

True, organic, or permanent strictures of the urethra, vary in their degree of constriction, becoming tighter when irritated by improper treatment, hard living, or exposure to damp or cold; indeed all mucous canals are sensibly affected by cold and damp. From these causes a combination may be produced of permanent stricture and spasmodic action; but, as already hinted, it would perhaps be well that this latter term, applied to urethral stricture, were forgotten, instead of remaining a conve-

nient excuse for want of knowledge or dexterity. Spasms of canals and cavities, unusual membranes, adhesions, sacs, and cysts, are too often met with in the Practice of Surgery, preventing the practitioner from accomplishing the objects of his operations, putting the patient to a great deal of unnecessary suffering, and even endangering his life. The old writers supposed that obstruction of the urethra arose from growths, warts, caruncles, or carnosities in the passage; and even in the present day such causes would sometimes appear to be more accredited than they ought; small excrescences do sometimes form on the membrane, though very rarely. True stricture is the result of inflammatory action in the part; at first serous effusion takes place beneath the membrane, and elevates it into an œdematous swelling, which, according to its extent, obstructs the canal; then lymph is deposited both beneath the membrane and external to it, becomes organised, and forms a permanent and more unyielding obstruction.

Strictures are of various kinds. The bridle stricture is rarely met with; a membranous band of organised lymph traverses the canal, and, according to the thickness of this membrane, the flow of urine is more or less impeded; in the majority of cases the morbid formation is thin and delicate, but still sufficient to scatter and diminish the stream. When a soft bougie is introduced, it is resisted by the stricture, and on examining the instrument when withdrawn, the transverse and central impression on its point marks the

existence of the bridle. The urethra is sometimes narrowed by a circular membranous ring projecting into its canal, composed of swollen mucous membrane with subjacent effusion, and presenting the appearance of a thread having been tied round the passage. Other strictures occupy a considerable portion of the urethra, from a quarter of an inch to two or three inches; differing from the preceding only in the effusion and membranous swelling being more extensive. Others are irregular, the contraction being not uniform at the narrowed point, and sometimes only one side of the canal is affected. Some are almost cartilaginous, the effused lymph having become much condensed after organisation; others are less dense in their structure, and exceedingly elastic. From repeated attacks of inflammation at the constricted part, and around, additional lymph is effused and organised, and thus the extent and tightness of the stricture is increased.

The urethra is generally constricted at those parts which are naturally the tightest; at the orifice—betwixt three and four inches from the orifice—and betwixt six and seven inches from the orifice; the most frequent site is perhaps anterior to the sinus. Contraction of the orifice is frequently the consequence of cicatrisation, and generally proves obstinate; in some cases the smallest probe is passed with difficulty. Considerable portions of the anterior part of the canal suffer contraction from the effect of ulceration; and congenital malformations of the orifice give rise to many affections of both the urethra and

bladder. Contractions in different parts of the canal depend much upon one another.

When a tight stricture exists, the passage anteriorly is never fully distended, and becomes permanently contracted in consequence; whilst more or less dilatation is produced behind the tight part, wherever that may be. The enlargement often is very great, the urine lodges in the cavity formed by dilatation, and can be pressed out in a stream, or dribbles away after the patient supposes that he has done making water. Mucous and sabulous deposits often lodge in it; and calculi are occasionally retained there, may attain a large size, and may give rise to very unpleasant and even dangerous symptoms. Not unfrequently ulceration takes place behind the stricture, and the urine becomes insinuated into the cellular texture; but this tissue immediately around is in general condensed previously to the giving way of the canal, and so prepared by lymphatic effusion as to oppose effectually extensive infiltration. Such is not the case, as will afterwards be explained, when solution of continuity in the urethra takes place in consequence of distension of the bladder.

In the gradual escape of urine by ulceration behind the constricted point—the urethra being neither altogether obstructed, nor nearly so—abscess forms in the cellular tissue, exterior to the ulcerating part. The suppuration is often slow in its progress, and imparts to that part of the perineum a stony hardness. Repeated collections of matter may form, and, if the cause be not removed, numerous openings will

form in the scrotum and perineum, and through them foetid matter and urine will constantly and involuntarily distil. The patient is reduced to a miserable state, the neighbouring parts are excoriated, and exhale a noisome odour, his body and bed are soaked and rotted by the discharge, and the atmosphere to a considerable distance around offends the nostrils. *Fistula in perineo* is established.

Ulceration and perforation of the urethra from stricture seldom takes place anteriorly to the scrotum ; but ulceration often is induced there by retaining instruments long in the passage, and may be followed by sloughing of the integuments, abscess in the cellular tissue, or both. Occasionally the urethra communicates with the rectum in consequence of ulceration, escape of urine into the cellular tissue, and formation of matter. The symptoms of stricture are often much relieved after the formation of fistulous openings ; and the cure can then be much more easily accomplished than formerly, the passage being less irritable. When the fistula is free and open, allowing the urine to escape readily, the natural passage contracts, and will become almost entirely obliterated, unless means are taken to dilate it, and to diminish the unnatural opening. Neglected aggravated cases are met with, in which the urine has passed entirely through the false passages for years, the urethra and penis, anterior to the stricture, being both rendered completely useless ; but even such can, by proper management, be permanently cured. Ulceration of the urethra, originating in consequence of stricture,

may proceed even after the stricture is removed, and give rise to abscess and fistula.

Many patients labour under stricture, and even tolerably bad ones, without being aware of it. But the surgeon is led to suspect the existence of stricture, by complaints which the patients wish to be relieved of, and which they suppose to arise from totally different causes—pains in the loins or hips, indolent swelling of the testicle, or of the inguinal glands, irritability about the fundament, gleet. On enquiring about the stream of urine, the patient may declare that it is as good as possible; and many say so without intending to deceive, for the stream diminishes so gradually, that the patient is not aware till after he is relieved that he has been voiding his urine in a very imperfect manner. On questioning further, it is discovered that the stream is forked or twisted, or divided into several small ones; that there is frequent desire to empty the bladder, during the night particularly; and that at first the urine comes away only in drops. A long time is occupied in passing even a small quantity of urine, and the patient has to strain much; in bad cases he is almost always obliged to go to the water-closet when inclined to make water, lest the contents of the rectum be evacuated by the great exertion of the levator ani and abdominal muscles, necessary to overcome the obstruction in the urethra. By the straining hernia is also frequently induced.

In consequence of the almost constant endeavours to overcome the resistance afforded by the stricture,

the bladder becomes much strengthened in the coats, and diminishes in size. All the coats are affected, but particularly the muscular; the surface becomes fasciculated; the fibres grow fleshy and strong, and are collected in large bundles. Cysts form, often of a large size; some are caused by interlacement of the enlarged muscular fibres, others are produced by outward protrusion of the mucous coat. This membrane being, by excessive muscular action in the viscus, pushed between the enlarged fasciculi, dilates into a bag, and forms a cyst of greater or less size, communicating with the cavity of the bladder, generally by a narrow neck; the protruded membrane is thickened by new deposit, and ultimately the parietes of the cyst, in some degree, resemble those of the bladder. Cysts of this description are usually situated near the fundus of the organ, and often attain a large size; in some cases the cyst equals the bladder in capacity; and the two seem to form one large organ contracted near the middle. The secretion from the surface of the bladder becomes vitiated, is much increased in quantity, and passes off along with the urine or after it—sometimes in solution, often separately. In severe cases the ureters and pelves of the kidneys dilate, and their mucous surfaces also contribute to furnish the discharge, in general slimy, ropy, and tenacious, sometimes puriform. Discharge also takes place from the stricture, from the dilated portion, and from behind this; it is a kind of gleet, very apt to be increased by excess in drinking and venery. After

debauchery, the stream of urine—which was previously not much affected, at least to the patient's observation—comes to be very small; and frequently the urine can be voided only in drops, and that with much labour. Besides, the balance between the retaining and expelling powers of the bladder often is lost, and either incontinence or retention of urine is the consequence. Though the urine be much obstructed, even when the stricture is not very tight, the flow of the semen is not; the degree of contraction must be very great to prevent ejaculation of the latter fluid. Indeed, during the healthy state of the parts, the whole urethra is much narrowed, as well as shortened, during seminal emission in coitu, from forcible action of the muscular fibres, and injection of the corpus spongiosum; and the momentary contraction of the passage in such circumstances is perhaps greater than almost ever occurs in consequence of disease. Sometimes the seminal fluid passes back into the bladder, from an inverted action of the canal, and is evacuated along with the urine; nocturnal emission is a frequent concomitant of stricture. That an inverted or antiperistaltic motion sometimes exists in the urethra, is shown by a soft bougie being in such cases drawn into the bladder after having been passed but a short way into the urethra.

In cases of bad stricture, the complexion is sallow, the countenance anxious, and the general expression of the features so peculiar as to be almost pathognomonic. The lower limbs become emaciated and weak. Gout often accompanies stricture, and pa-

roxysms of it are induced by irritation of the urethra; the canal itself is said to be sometimes affected with a gouty action.

Stricture may be caused by inflammation or long-continued irritation of the urethra, however induced—by mismanaged virulent gonorrhœa—by stimulating acrid injections—by piles, and other irritations about the fundament—by calculi passing along the urethra. That gonorrhœa is a very frequent cause of stricture has been long known—“If the case be slubbered over, and long delayed, caruncles arise in the urethra, and in progress of time a carnosity.” The passage or lodgement of calculi in the canal has induced stricture even in children; and calculus in the bladder is supposed sometimes to produce disease in the urethra, and *vice versa*. Strictures are often caused by falls or blows on the perineum, and such cases are of the very worst kind; in some the urethra becomes almost entirely obliterated, in most the stricture is extensive and callous, and in all the disease is overcome with difficulty.

When stricture is suspected the urethra must be examined. A soft white-wax bougie is best adapted for ascertaining the state of the parts, but must be used very gently. If pushed forwards rashly and with force, the instrument yields before the stricture, and when withdrawn, is found twisted like a screw, or doubled backwards on itself. The vessels of the urethra may be torn, and hæmorrhage, with great pain, ensue. The bougie should be slightly curved in its farther extremity, warmed either at the fire or by friction with the fingers, and well oiled, pre-

viously to its introduction. It is then passed softly along the canal till its progress is arrested ; thus the situation of the stricture is ascertained. Then a little more pressure is employed for a short time ; if the instrument have not become insinuated into the constricted part, it will resiliate on removal of the pressure from its free extremity ; if it is passed into or beyond the stricture, it is firmly grasped by that part of the urethra, and retained ; thus we discover the degree of contraction ; and from the extremity of the bougie receiving and retaining the impression made thereon by the contracted part, we can form an accurate diagnosis regarding the nature and extent of the stricture. The information thus acquired is afterwards acted on. Ball probes have been proposed for the examination of the urethra : they look well on paper, but are of no practical utility.

The principles on which the cure is to be conducted are the same in almost all cases ; but the particulars of the treatment must vary according to circumstances. In slight cases, the gentle introduction of a moderately-sized bougie produces a cure by removing the irritability or susceptibility of the surface ; the relaxed membrane is stimulated by the distension made with the bougie, and soon regains its natural tone. It may be necessary to repeat the introduction of the bougie a few times, at considerable intervals. In tight organic stricture something more is required ; the constricted part must be dilated gradually. Much dexterity and management is often required to pass an instrument through a tight stricture, particularly

if inflamed ; and in such circumstances the attempt should not be made but on good grounds, and to relieve urgent and dangerous symptoms ; but after a bougie or catheter, however small, has been got past, the disease is completely under the control of the surgeon, and a cure must follow if the treatment be properly conducted. The effect of an instrument passed through an organic stricture is to remove the irritability of the lining membrane, to excite the absorbents to remove the newly-formed parts, and to dilate the passage : it may be supposed to act in some measure on the same principle as a bandage applied to a swelled extremity. The instruments introduced must be gradually enlarged till one readily passes of the full size, that is, one that enters the orifice with some difficulty, and fully distends the rest of the canal. Numerous contrivances have been employed for the dilatation of strictures ; but the preferable instrument is a silver catheter, or a bougie made of silver, of steel, or of plated metal. A soft gum-elastic bougie is useful in ascertaining the nature and situation of the stricture ; but in the treatment must give place to the metallic, slightly conical at the point. This, in the hands of a well-qualified person, can be more surely and readily directed than a flexible one, and in its use there is less risk of injury being inflicted on the passage ; besides, it does not yield to the action of the diseased part. The practitioner must be provided with a full assortment of metallic bougies, each one differing from the other in size ; for, as already observed, the size of the in-

strument passed must be gradually increased: and, besides, the calibre of the canal varies much in different individuals; what is a full size for one person may be but a trifle in the urethra of another. The bougies are arranged by what is termed a size-plate or gage, a flat piece of steel, containing fifteen or sixteen circular perforations, which commence about the size of a small crow-quill, and gradually enlarge in diameter. These apertures are numbered, and the bougie which fills one has the corresponding number imprinted on it. By reference to the numbers, the surgeon is at once made aware of the progress he has made towards a cure.

In the more common and simple cases, a regular and gradual ascent in this scale is all that is required, allowing a proper interval to elapse betwixt the introductions. But in tight and unyielding stricture, small, firm, silver catheters are required. One of these of a size proportioned to the contraction of the canal—and the calibre often must be extremely minute—is passed through the stricture or strictures by dexterous, persevering, and at the same time gentle pressure in the proper direction. If the diseased part be anterior to the bulb, it can be grasped between the fingers of the left hand, whilst with the right the instrument is insinuated into it; thus the part is steadied, and the course of the catheter made more certain and safe. If it be posterior, assistance in the introduction, and information as to the direction and progress of the instrument are obtained by the forefinger of the left hand being placed in the bowel; and this is the

more necessary when the stricture is of an elastic nature. Considerable experience is requisite to enable the surgeon to be aware of the progress he is making with the instrument, and whether or not it is advancing fairly in the canal; much information as to this is imparted by the sense of feeling. If the point of the instrument be within the contracted part, it will be felt embraced and obstructed, and on withdrawing the pressure, it will be stationary; if it have not entered the stricture, but is pushing it before it, resistance will be felt as soon as the pressure is either diminished or removed. The sensation imparted when the instrument has left the canal, and is forming a false passage, is of a peculiar grating nature, and when once felt, will scarcely be forgotten or mistaken. By means of a good knowledge of the natural course of the urethra, and an acquaintance with the feelings just alluded to, but which cannot be graphically described, the surgeon of experience is enabled to avoid blunders, and to pass an instrument with safety through the tightest strictures. It is, however, an operation of very great difficulty in aggravated cases, perhaps the most difficult in surgery; facility in passing the catheter is acquired only by practice and experience. The greatest caution is required, along with considerable fortitude and perseverance; there is always a risk of making false passages,—the most dexterous surgeon may so err in a moment of negligence or rashness,—and when once established, it is a difficult matter to avoid them.

When the instrument has been fairly lodged in the bladder, it is to be retained. A tape is attached to each of the rings at the neck of the catheter, is brought under the thigh, and fastened to a bandage passed round the waist; this simple retentive apparatus is quite effectual, and suits the erect as well as the recumbent posture. A peg, of metal or wood, is placed in the mouth of the catheter, that the patient may be kept dry, and at the same time have it in his power to relieve the bladder as often as necessary. The instrument should be retained for twenty-four hours at least, and, if the patient can bear it, for forty-eight, or even more. At first it occasions considerable uneasiness, pain, and excitement, but these gradually subside; when severe, they may be allayed by opiates. The parts make efforts to get rid of the foreign body, and these efforts are salutary. Discharge takes place from the membrane, and oozes by the side of the catheter; relaxation occurs, often to a very great extent; and, on moving the handle of the instrument, it is found to be not only less firmly grasped, but to possess considerable freedom of motion in the contracted part. Thus a most successful inroad is made upon the disease, and the after treatment thereby happily abridged. The instrument is withdrawn, and time afforded for the parts to become quiet. After the lapse of two, three, or four days, according as the uneasy feelings disappear, a larger instrument is introduced, and retained perhaps for half an hour; and the successive introduction of instruments—bougies being now

adopted—at proper intervals, and in proper graduation, is continued as in ordinary cases. Sometimes, though rarely, the good effects of the first introduction and retention quickly disappear, the stricture becoming tight and unyielding as before; when this takes place, the practice is to be repeated, but not till after several days, and then the instrument will be retained with advantage for a longer time than before, provided no untoward symptoms are caused by its lodgement. There are very few strictures, indeed, which will not yield to this treatment, when judiciously planned and perseveringly followed.

Fistulous openings generally close in a short time, when once the urethra has been widened. Their contraction may sometimes, however, prove slow and imperfect, even after the stricture has been entirely removed, and the application of the cautery may be requisite; to accomplish this, when the opening terminates in the rectum, a speculum ani is required, by which to view the aperture, and ascertain its site, and along which to pass the heated wire with safety to the bowel. The cautery is not to be applied so as to produce an extensive slough, and much loss of substance, but lightly to the edges. On the separation of the superficial eschar, the margins are raw, excited, and swollen, with a disposition to granulate; and during cicatrisation of the sore, considerable contraction takes place, independent of the formation of new matter. After the contraction thus effected has occurred to its full extent, and not before, the cautery is reapplied; and by a few repetitions of the instru-

ment at long intervals, the opening is brought to close.

At one time attempts to destroy the contraction of the urethra, by the application of caustic to the stricture, were in great vogue ; but the total inefficiency of such practice is now generally acknowledged. The armed bougie was applied hundreds of times, at considerable intervals ; and the mode of treatment, though trying, tedious, and hurtful to the patient, must have proved useful to the surgeon—but to him alone. Years were spent in such trifling, and not unfrequently serious consequences followed this treatment, or rather neglect, of the disease. Cutting catheters are dangerous, as well as inefficient for the cure of stricture ; thrusting at the end of a long stricture can avail but little, and in the hands of most practitioners the instrument is as likely to perforate the coats of the urethra as to enter the stricture.

Incision of stricture may be required in retention of urine, scarcely otherwise. The practice is noticed under the treatment of retention. In stricture anterior to the scrotum, it is well to avoid incision, if possible, as it generally is, for a wound there is healed with difficulty, if at all.

Retention of Urine is not to be confounded with *suppression* of the secretion from the kidneys, arising from disorder of the structure or function of these organs. The kidneys perform very important functions in the animal economy, and complete suppres-

sion of their secretion is a very suspicious and dangerous occurrence.

In the healthy state of the urinary organs, when the powers of each correspond, the urine passes without almost any exertion on the part of the patient; the action of the levator ani and abdominal muscles is scarcely required. But when either structure or function is disordered, the balance between the parts is upset; additional assistance is necessary for expulsion of the contents of the bladder. The symptoms of *retention* differ according to the state of the parts and the cause which has induced it. The bladder varies in size, and in distensibility. In some cases the organ yields readily to the accumulation of fluid within it, rising high in the belly, reaching even the umbilicus, and forming a large, oval, tense, fluctuating swelling, apparent to the most careless and casual observer. The swelling and fluctuation are in such circumstances so distinct, that the disease has actually been mistaken for ascites. Again, all the symptoms of retention may exist, and all its bad consequences result, without any apparent swelling of the abdomen. But then the distended bladder can always be felt by the finger introduced into the vagina or rectum; indeed its posterior fundus bulges in towards the cavity of the gut, in every case, before it ascends upwards in the abdomen. Sickening and agonizing pain, with great anxiety and ineffectual straining, generally attend distension of the bladder to any great degree. When the distension is allowed to continue, urinous fever supervenes, the

circulation is accelerated, the patient perspires profusely, and exhales a urinous odour; delirium comes on, followed by sinking, and, if the cause is not removed, coma terminates the distressing train of symptoms. In other instances, the painful feelings subside after some time, and the urine is discharged involuntarily from the urethra. The ureters lose the valvular structure of their vesical terminations, and become dilated; the pelvis and infundibula of the kidneys also enlarge, and all are distended by the accumulating urine. On relieving the bladder artificially, the pressure is taken off the kidneys, their secretion is generally renewed with great vigour, and the bladder is again filled rapidly. If the bladder is not relieved, the secretion of urine is suppressed.

In many cases the urethra—the bladder more rarely—sloughs or ulcerates, unless preventive measures are adopted, and extravasation of urine takes place into the cellular tissue of the pelvis, of the perineum, of the groins, of the lower part of the abdominal parietes—into the cellular substance of the scrotum, and of the penis—the parts infiltrated depending of course on the point at which the urinary canal has given way. Under such circumstances the patient is sometimes rapidly destroyed, the extravasated urine appearing to induce speedy sinking, like to the effects of inoculation of the most virulent poison. If the urine escape into the cavity of the abdomen, the patient inevitably perishes, and that very speedily; and when the cellular tissue of the pelvis

is the seat of the extravasation, little hope can be entertained of recovery, though the fatal termination may not be so rapid as in the former case. When the urine is effused into more external parts, as into the perineum or scrotum, the danger is also imminent, if the fluid is allowed to accumulate and become extensively infiltrated; but when it freely escapes externally, either spontaneously or by incision, there need in general be no great apprehension of immediate danger. In such cases the aperture in the urethra is found to be at first irregular and ragged; afterwards its inner surface becomes rounded off, and a papilla presents externally. The infiltrated cellular tissue is dark, foetid, broken down, and soft, sometimes seemingly in part dissolved by the putrescent urine; and, when the patient has survived a considerable time, it frequently resembles closely in appearance a portion of suppurated lung. When active practice is not adopted after extravasation of urine has taken place, the cellular tissue around sloughs along with the integuments; rapid depression of the powers of life ensues, with great disturbance of the sensorial functions. Death very soon relieves the patient from his sufferings; some few struggle through, and recover, after losing the coverings of the penis, of the testicles, and of the perineum.

The causes of retention are many; but the surgeon must know them all, as the treatment must vary according to the cause. They may be divided into such as weaken the power of expulsion, and into such as impede the progress of the urine in the urethra.

Retention of urine is caused by *paralysis of the bladder*, from over-distension, from injury or disease of the spinal chord, from pressure on the spinal chords or nerves. In such cases the bladder often attains a very large size. At first the accumulation produces all the uneasy symptoms formerly mentioned, but after some time these subside, and the urine drains away according as it is secreted, without, however, the original accumulation and tumour being diminished. This state of the urinary system is very common in old people, who neglect natural calls to empty the viscus during the night, or while sitting socially after dinner. The uneasiness gradually goes off, and when they at length think of making water, none can be got to flow. Sometimes they remain in this state—the bladder full, and becoming more and more distended—for days, drinking gin and water, juniper tea, or other popular remedies. Incontinence then takes place, and the dribbling of the urine affords considerable relief; this state of matters is often allowed to continue for weeks. Thus the power of expulsion may be lost for ever, though sometimes it is regained even under very unfavourable circumstances. I recollect attending a man upwards of eighty, labouring under retention of urine with incontinence, and whose bladder required relief by the catheter for ten or twelve days; at the end of that period the bladder regained its expulsive power, and retained it; and cases are on record in which the power of expulsion has returned after the lapse of several months. Retention thus induced is

often complicated with disease of the prostate gland or of the urethra. The patient, perhaps, has been for a long time incapable of emptying his bladder completely; a portion of the urine always remains in the most dependent part of the viscus, and the quantity retained becomes greater and greater, until from some slight cause the power of expulsion is lost entirely. In these cases the bladder, though much increased in capacity, is also much thickened.

Retention from *inflamed urethra*, attended with swelling and spasmodic action of the sphincter vesicæ, is preceded by hardness and tenderness in the course of the urethra, and a smarting felt when a drop of urine passes along. Retention not unfrequently takes place during gonorrhœa, from the dread which the patient has of making water; and from the swelling of the lining membrane.

Retention from *abscess in the perineum* was formerly noticed.

Retention from *injuries in the perineum*. The urethra is either severely bruised, perhaps lacerated, or torn completely across; and if the patient attempts to make water before proper means are adopted, blood and urine are extravasated into the cellular tissue exterior to the canal. In cases of slighter injury, retention may occur on account of the inflammatory swelling of the parts supervening secondarily.

Retention from *stricture of the urethra* is of very frequent occurrence, and most difficult to manage. The state of the urethra and bladder in this disease

has been already adverted to, but it is necessary to bear in mind the thickening of the latter, and the dilatation which uniformly takes place behind the stricture. All the urgent symptoms of retention may, in this case, arise from the accumulation of but a few ounces of urine. The bladder contracts frequently and very forcibly, causing great suffering. Temporary relief is experienced when the urethra gives way by ulceration, and the urine becomes extravasated into the cellular texture; the patient gets up, and, if in the dark, thinks that the stricture has yielded, and that he is passing urine naturally. But soon he feels a glowing heat in the perineum, the parts swell and become livid; violent constitutional symptoms come on, the discoloration advances, the integuments slough, ill formed matter is discharged, and disorganised cellular tissue mixed with putrid sanies is exposed. The parts exhale a urinous odour, which, when once felt by the practitioner, can never afterwards be mistaken. Occasionally œdematous swelling of the penis takes place, particularly of the prepuce, when it has been pulled at and bruised during the patient's efforts to make water, and this must not be confounded with infiltration of urine; I have seen it occur some time after the bladder had been relieved by the catheter.

Retention from the *lodgement of calculi*. Temporary obstruction to the flow of urine is sometimes experienced from calculus in the bladder. Complete and fatal retention has arisen from calculi having become impacted into the urethra, and been allowed to remain there, blocking up the passage entirely.

Retention from *affections of the prostate gland and neck of the bladder*, inflammatory or indolent. In acute inflammation of the prostate gland and cervix vesicæ, the other parts around swell, the mucous membrane becomes turgid and more villous, and the mucous secretion is increased. Suppuration may take place, and an abscess, chronic or acute, form in the substance of the gland, or in the cellular tissue exterior; the parietes of the abscess may give way, and the matter be discharged into the bladder, into the rectum, or into the cellular tissue of the perineum.—Bloody and mucous discharge from the urethra, frequent desire to make water, sudden stoppage of the urine whilst making water, pain in the glans penis, and other symptoms of stone in the bladder, followed a fall on the back. Afterwards, a tumour pointed into the rectum, and was opened; purulent matter was profusely discharged, and afterwards urine escaped through the aperture. The patient died in three weeks, from irritative fever, with gastro-enteritic symptoms. Along with thickening of the bladder, and disease of its mucous coat, there was found a large abscess of the cellular tissue, communicating with an abscess in the third lobe of the prostate gland, and that with the cavity of the bladder.

When the inflammation is less acute, the prostate slowly enlarges, from opening out of its texture, and deposition of new matter in the interstices. The whole gland may enlarge uniformly, but generally one part protrudes more than the others. When the third lobe enlarges, it necessarily projects into the

bladder, or into the prostatic portion of the urethra, and there acting like a valve, causes much more formidable obstruction to the flow of urine than does enlargement of the lateral lobes; and the obstruction is the more complete the greater the distension of the bladder. At first, this lobe is but slightly prominent, and of a conical form; but as it enlarges, its regularity of shape disappears, the tumour is nodulated, and in general somewhat pyriform. The affection is seldom met with, unless in old people.

In consequence of prostatic enlargement, pain is felt in perineo, with occasional throbbing, and a sense of weight; there is frequent desire to make water, the bladder is irritable and discharges ropy mucus. There is more or less irritation of the lower bowels; there is an almost constant desire to empty the rectum, from a feeling of fulness there, and pain, often severe, is felt on going to stool; when the enlargement is great, the bowel is considerably compressed, and the fæces, when solid, are passed flattened like portions of tape. Frequently there is thin mucous discharge from the urethra. In making water, the urine, as it were, hesitates, and after a while passes away at first in drops, and afterwards in a scanty and irregular stream; pain is felt at the point of the penis, in the loins and hips, and often in the inside of one or both thighs. On attempting to pass the catheter, its extremity is obstructed in the prostatic region, and the swelling can be felt by the finger introduced into the anus. Examination

of the tumour, per anum, often is a very painful proceeding; it is best accomplished when a catheter or sound is introduced. The disease is often co-existent with calculus in the bladder. The tumour is very seldom malignant, but proves both troublesome and dangerous from its size. The bladder may become distended in consequence, though retaining the power of partially relieving itself; or the urine may come away involuntarily after some time; or retention may be complete, and, if not relieved, the bladder or urethra may slough.

It is to be recollected, that in retention of urine, from whatever cause, and particularly in that arising from prostatic enlargement, the urethra is elongated, and the bladder rises into the abdomen like the gravid uterus. The reason of such change of relative situation is sufficiently obvious, being chiefly mechanical.

Fungous, or other tumours, furnishing blood or vitiated puriform matter, now and then grow from the internal surface of the bladder, unconnected with the prostate gland. Worms, too,—*spiroptera hominis*,—occasionally lodge in the bladder. Either of these circumstances may induce retention of urine. Another cause of obstruction is hernia of the bladder.

There is no disease in which the patient is more liable to be 'bungled out of his life,' than in retention of urine. Great credit is to be gained by judicious and skilful management of the various stages, and by expert use of the catheter in difficult cases, when others, after being foiled, have proposed opera-

tions alarming to the patient, and dangerous. In no disease are patients more grateful for relief, for in this the agony is often unbearable. Immediate abatement of all painful symptoms follows skilful and prompt measures; and the superior science of one man over others is made apparent to the most ignorant observer. In over-distended bladder from paralysis, the catheter can in general be passed without difficulty. It should be of a large size, and its introduction should be repeated as often as nature calls for relief, perhaps three or four times during the twenty-four hours, until the viscus regains its tone; and this, unless irrecoverably lost, will generally be restored in a few weeks at most. Repeated introduction of the instrument is here preferable to the retaining of it; the latter measure should always be avoided, unless absolutely indispensable, for a foreign body lodging in the urethra and neck of the bladder must always be a source of more or less irritation; and experience shows that the bladder sooner recovers its tone when the instrument is introduced only to draw off the urine, when the uncomfortable feelings of distension come on, than when it is constantly retained. The patient soon learns to pass the instrument himself, and thereby saves the surgeon from frequent attendance, whilst, at the same time, the bladder is opportunely relieved. Stimulants, as the *tinctura lyttæ*, given internally, with external friction, blistering, or the application of a moxa, may contribute towards restoration of the muscular power

of the organ. Injections into the bladder have been recommended, but are both hurtful and inefficient. Enemata, containing turpentine, or other stimulating fluids, are of service.

In retention from inflamed urethra, the catheter should, if possible, be dispensed with. The introduction of it is excruciatingly painful, and will certainly aggravate the original affection. Blood should be abstracted both from the system and from the perineum; fomentations, with the warm bath or the hip bath, are afterwards to be employed. The retention is usually induced by over-exertion in exercise, or intemperance in living; these of course must be abandoned, and their opposites enjoined. Camphor, alone, or combined with opium, is to be given internally in large doses. Opium may also be useful, administered in the form of an enema or suppository. If relief is not soon afforded by such soothing measures, the bladder must be relieved by the catheter; and if the surgeon be foiled in the introduction of this, as he ought not to be, the only resource is to puncture the bladder from the rectum—a harsh measure, to be sure, and one not indicative of surgical talent, but still preferable, in the eyes of both patient and surgeon, to death.

In retention from abscess in perineo, a little delay is allowable under the employment of palliatives, when the affection is acute. The abscess must be freely opened as soon as its seat is discovered; and until the evacuation of the matter, the use of the

catheter should be deferred if possible. In cases of chronic abscess, the catheter must be used, and does no harm.

In retention from injury of the perineum, the catheter should be passed before the patient attempts to make water, and the instrument must be retained; thus extravasation of urine into the cellular tissue will be avoided. If extravasation has occurred, the perineum, scrotum, or other parts, must be freely incised wherever the urine has been effused, in order to prevent the direful effects of lodgement of that fluid; and then the catheter should be passed and retained as in the former instance. If the surgeon be foiled in introducing an instrument, as he may be, and if the prostate be sound, the bladder must be relieved by puncture from the rectum.

Retention from stricture is, as already observed, the most difficult to manage. No time can be put off in bleeding or warm bathing, in giving internal remedies, or exhibiting enemata. The viscus is making violent efforts to relieve itself, and if these are left unassisted, or not rendered unnecessary, they may prove the patient's destruction. The system may be drained of blood, and the body parboiled, without the patient being relieved. The case requires immediate and decided practice; for whilst the surgeon is consulting about what is to be done, the urethra may give way, and the patient be lost. The discharge of a small quantity of urine may follow the introduction of small flexible bougies, but the

bladder is not relieved. The throwing of cold water on the thighs may, in slight cases, induce such contraction of the expelling muscles as may overcome the resistance in the urethra, and this method has been had recourse to after failure with the catheter ; but he must be a very poor surgeon who is foiled, when such practice is successful.

Immediate recourse must be had to the firm silver catheter, proportioned in size to the tightness of the stricture, and the difficulties afforded to its introduction must be overcome by skill and perseverance ; it is no easy matter to pass the instrument in many cases, and particularly when ineffectual attempts have been made previously. By gentle insinuation, and perseverance in moderate pressure, properly directed, the obstacle can always be overcome,—and that without the infliction of any injury to the parts. I may here observe, that I have never yet been foiled in passing the catheter, though many severe cases have fallen to my lot ; in other words, I have never been obliged to abandon my attempts to obtain an exit for the urine by its natural passage, and, as a last resource, to mutilate and endanger a patient by making an unnatural aperture in his bladder. Yet circumstances may soon occur to me in which the introduction of an instrument along the urethra shall be impossible ; no man can be always wise or always fortunate ; he who pretends to invariable success must be either a knave or a fool.

Should the surgeon fail in passing the catheter,

the bladder must be relieved at all hazards; and if the prostate be sound, puncture by the rectum may be performed. This is neither a difficult nor a dangerous operation, else it would not be so often resorted to; it does not require so much skill and management as does the passing of a catheter. Neither is it painful to the patient; the parts to be perforated are thin, there is scarcely any effusion of blood, and all is done in the dark. But it is an operation which should never be thought of, unless as a last and desperate remedy; it is one in which I have had no personal experience, though I have seen it done repeatedly. The procedure gives temporary relief, but then the urethra still remains to be put into a proper condition; a man cannot always void his urine and excrement through one common cloaca. If the urethra be cleared, the recto-vesical aperture may soon close. After the bladder is relieved, the urethra may become quieter, and admit of an instrument being passed; but it is of very great consequence to effect the introduction of a catheter at the first.

Rather than puncture the bladder, the stricture should be cut down upon, and an opening made into the dilated part of the urethra behind the stricture. A firm silver catheter is passed down to the stricture, and retained there by an assistant; an incision in the line of the central raphe—supposing the constricted part to be in the perineal region—is made over the extremity of the instrument, the contracted part of the urethra is divided, and the catheter passed

on into the bladder. Thus, even in the worst cases, the natural canal is at once established. In every instance of difficulty and complication, the catheter, however passed, should be retained for two or more days. The above is the only admissible mode of puncturing by the perineum. It has been proposed, and practised on the continent, to reach the bladder from the perineum either by incisions or by the random thrust of a long trocar; the latter mode is unscientific, the former is unnecessarily painful, serious, and difficult; both are dangerous, and to be avoided.

The symptoms of extravasation of urine have been already detailed. The practice must be bold, and adopted without hesitation or delay. No bulging or fluctuation in the perineum is to be waited for. Extravasation can never be mistaken or overlooked by a man of any experience, and who is endowed with common observation. The effect and extent of the perineal fascia must be borne in mind; it diminishes or precludes—when the point at which the urethra has given way is interior to it—external appearance of the mischief, and by confining the deleterious fluid increases the infiltration internally. A free and deep incision holds out the only chance of relief; punctures or trifling scratches are worse than useless; neither is there any need of passing bougies or catheters, or of puncturing the bladder.

The following appears to me an instructive case, and may be briefly detailed *in terrorem*. A man applied for relief, with a large swelling in the hypo-

gastrium, occasioned by extensive infiltration of urine into the cellular tissue of the abdominal parietes. The tumour was mistaken for distension of the bladder, and a long trocar was plunged in above the pubes without a drop of urine escaping. The patient died during the night. The bladder was found contracted, and the external cellular tissue of the abdomen full of urine.

When judicious and energetic practice is adopted without delay, patients often make wonderful recoveries. The following may serve as an example—An elderly man laboured under retention, and his bladder became distended to a very great degree; attempts had been made to relieve him, but proved unsuccessful. A catheter was passed, and retained for three days. During my absence in the country retention again occurred, followed by extravasation. On my return I found him insensible, but immediately turned him round in bed, and opened the perineum freely, giving vent to foetid urine, sloughs, and matter. Next day he was delirious and knew no one; he hiccupped and had cold extremities; “he fumbled with the sheets,” and “his nose was as sharp as a pen.” A physician in attendance, well acquainted with disease, declared that he could not live six hours. But the urine had a free exit, the hiccupped ceased on the exhibition of spiritus ammoniæ aromaticus, and wine and brandy were poured into him liberally, the only favourable symptom being, that he still retained the power of swallowing—when that is lost, all is generally lost.

He took soup along with the stimulants readily and greedily, and to the astonishment of every one recovered rapidly; afterwards the stricture was got rid of, and restoration to perfect health completed. Many cases of similar import might be related, all showing the great danger of extravasation of urine, and the advantage of early and decided treatment. I have also lately witnessed an unexpected recovery from extravasation into the corpus spongiosum urethræ. This occurrence is always attended with most imminent risk; and is generally the result of retention from stricture. The urine escapes into the bulb, or anterior to it. Alarming constitutional symptoms quickly supervene; rapid sinking is threatened. The whole penis, scrotum, and perineum are swoln, but the swelling is hard, and most marked in the glans and along the course of the urethra. The glans blackens, unhealthy abscesses form in the spongy body, and before these give way, or at least before the sloughs begin to separate, the patient usually perishes. The man to whom I allude however recovered, retaining a part of the glans, as well as a considerable portion of the urethra and integuments; the rest sloughed and were discharged.

In regard to retention from swelling at the neck of the bladder, it may be observed, that spasm of that part of the viscus has been, by some, considered as a cause of the affection; such an idea is a bad one for him to entertain who enters on the treatment of the disease. The capacity of the bladder varies much in

cases of enlarged prostate; in general the organ bears a good deal of distension, and the urgent symptoms do not appear rapidly. Nevertheless, it is the duty of the surgeon, immediately on being called, to relieve the bladder. When the prostate is very large, and retention has continued long, it is impossible to reach the bladder by the common catheter. Those who employ this instrument in such cases are often much puzzled; they continue long in their fruitless endeavours, and, from rashness, generally produce a discharge of much blood, but no urine; they then become alarmed on finding the instrument always filled with coagulum, and suppose that blood has been effused into the bladder, and that the symptoms of retention have been thus induced. A catheter is to be used, which is two or three inches longer than the common one, possessing a larger curve, of such a size as to admit of being passed easily, and not so small as to render it liable to interruption from the lacunæ of the urethra. The posterior part of the urethra is elongated to no slight extent by the enlargement of the prostate, and besides, the whole canal is stretched by the distended bladder rising high in the abdomen. In short, the bladder is farther away from the surgeon than it is in other cases of retention, and he requires an instrument proportionally long in order to reach it. No time is to be put off. A cautious and persevering endeavour must be made to bring away the urine by the natural passage. Force is prejudicial and unnecessary. It is true, that the projecting third lobe of the prostate has not un-

frequently been perforated by the catheter, and no unpleasant consequences resulted, the urine continuing to flow, perhaps freely, through the artificial opening there; but still it is always an injury, often an unnecessary injury, and as such to be avoided. The catheter is to be passed steadily on till it approaches the prostatic region, it is then to be guided by the forefinger of the left hand introduced into the rectum, and when the point is lost in passing through the gland, the instrument is carefully carried forward, and if long enough will infallibly reach the urine and relieve the bladder. It must, indeed, be a very extraordinary case in which the bladder cannot be reached with the catheter.

When enlargement of the prostate, whether of the whole gland or principally of the third lobe, presents an insuperable obstacle to the passage of the catheter, and when the surgeon has taken care to assure himself that such is the case, I conceive that he ought to perforate the gland in the direction of the natural course of the urethra, not with the catheter, but with an instrument better adapted for the purpose—a long canula, or catheter with open end, very slightly curved towards the extremity, provided with two wires, one blunt and bulbous at the extremity, the other pointed as a trocar, both made so as to project a short way beyond the end of the canula. The canula is passed on to the resisting body, its orifice occupied by the bulbous wire, which is then withdrawn, and its place supplied by the trocar, the instrument being held steady in the proper direction. The trocar, or stilet,

is pushed forwards along with the canula ; the former is then withdrawn, and the latter retained. This proceeding I consider quite safe in the hands of an experienced surgeon, one well acquainted with the urinary passages—but not otherwise. It is in every way preferable to puncture of the bladder above the pubes, to puncture behind the prostate, or to puncture of the prostate along with wound of the rectum.

As before noticed, I never have had occasion to puncture the bladder but once—then it was above the pubes, and for an unusual affection of the bladder, the particulars of which have been already detailed. The result of the experience of several eminent surgeons, both in this country and abroad, is similar.

Elastic gum catheters have been recommended in this affection, and it is said that after the instrument has been passed to the prostatic region, its entrance into the bladder is facilitated by gently withdrawing the stilet, the point of the catheter being thereby curved upwards, and, as it were, lifted over any central projection of the prostate that may impede its straightforward introduction. But, according to my experience, this instrument is far inferior to the firm silver catheter.

In all cases of retention when the urine cannot be brought away per vias naturales, and when no farther assistance or advice can be procured immediately, the surgeon should puncture the bladder rather than leave the patient to his fate ; and the operation should be

performed early. He must not temporise till all chance of recovery has gone by. By not operating till late, in this or any other disease, when no reasonable chance of saving the patient exists, our department of the profession is brought into discredit and contempt. Delay is more dangerous than even the worst mode of making an opening into the bladder ; and while life exists, the patient should have his chance. Some defer extreme measures from day to day, either from hesitation or from a false hope that matters may ultimately change for the better, but the delay of one hour is in many cases most hazardous. In retention from disease of the prostate, extravasation of urine is more dangerous—more certainly fatal—than in other circumstances. Here a part of the vesical parietes gives way by sloughing, and the fluid is effused within the ilio-vesical fascia ; in other cases the extravasation is usually beyond that fascia, and beneath the fascia of the perineum.

Puncture by the Rectum is, in cases of enlarged prostate, inadmissible and highly dangerous ; the operator must either perforate the gland, or enter the cavity of the abdomen. Even in the healthy state of parts, there is very little space between the posterior part of the prostate and the reflection of the peritoneum. The operator having ascertained that the prostate is sound, and the rectum empty, introduces the fore and middle fingers of the left hand into the bowel, and along these passes a trocar and canula from four to five inches in length, of moderate calibre, and of a curve rather greater than that of the

sacrum. He places the point of this instrument on the part to be perforated, and fixes it there, the point of the trocar being hitherto withdrawn within the canula; the trocar is then protruded, and both carried onwards into the bladder. The part to be perforated is immediately behind the prostate.

Puncture above the Pubes is easily enough performed when the bladder is capacious, but it is at best a dangerous operation. The wound is made through loose cellular tissue; urinary extravasation into that tissue is apt to occur, and proves fatal. If the bowels are inflamed, or evince a tendency towards inflammatory action, the danger is increased, for a formidable wound is made in the immediate vicinity of the bowels. The operation has been resorted to when the catheter might have been passed without much difficulty; this statement may appear harsh, but it is too true, and can be borne out by indisputable facts. It is brought forward more as a caution to the young than as a reflection on the senior members of the profession. Some patients have recovered from the operation, and lived in misery for months and years, passing their urine through a canula retained in the wound. An incision is made above the symphysis pubis, in the mesial line, dividing the integuments and cellular tissue, to the extent of from one to two inches; on thus exposing the coats of the bladder, a flat trocar with a canula is pushed into the cavity of the viscus, at the lower part of the wound; the trocar is withdrawn, and the urine evacuated.

The treatment of enlarged prostate is palliative—

attention to the general health, the occasional administration of anodyne suppositories or enemata, prevention of accumulation in the lower bowels, either by gentle laxatives or the throwing up of bland fluid, and the avoiding as far as possible all sources to excitement, of mind as well as body. The radical cure is extirpation of the gland, but the cool proposal of such an operation would indicate either ignorance, or dereliction in principle, or mental obliquity, or all combined.

In retention from effusion of blood into the cavity of the bladder, a long catheter will sometimes evacuate the urine, and after some time also the blood; for the latter, though at first coagulated, ultimately becomes dissolved in the urine, and passes off along with it, even through a catheter of no very large calibre. Should this fail, and the symptoms continue urgent, an exhausting syringe should be employed, well adapted to the extremity of the catheter. After the urine has been thus evacuated, should a suspicion remain of coagula being still in the bladder, some warmish water may be injected with the view of promoting the breaking down of the clots, and then the exhaustion may be repeated.

Incontinence of Urine, as already observed, is a common result of distension of the bladder and of stricture. But it also occurs as a primary affection, particularly in young people, from irritability of the posterior part of the urethra not suffering the urine to accumulate within the bladder as in ordinary cir-

cumstances. It is removed by the application of a blister to the perineum, and by the patient attending to empty the bladder at intervals during the night. Children, and even mothers, sometimes have recourse to a more effectual method, the application of a tight ligature round the penis. But of the folly of such practice, the following may serve as an example. A. R., when a boy, passed a brass curtain-ring over his penis to prevent incontinence of urine during the night, and thereby escape chastisement, to which he had been frequently subjected. Great swelling soon took place round the ring, and he was unable to remove the jugum. He experienced much pain and difficulty in voiding his urine; the integuments under the ring gradually ulcerated, the ring appeared to sink into the substance of the penis, and the swelling subsided. The integuments met and adhered, the foreign body was concealed, and all uneasiness soon ceased. The penis performed well all that was required of it; the urine passed easily, and after a while he became the father of a fine family. When between fifty and sixty years of age, he applied to me. For some years previously difficulty in making water had been coming on, and frequent desire to pass it in the night-time rendered him very uncomfortable. He was under the necessity of having a vessel constantly in bed, and was generally disturbed every half hour. The penis had become very unserviceable, and he was now anxious to have the ring removed. A broad hard substance was felt surrounding the penis, close to the symphysis; an inci-

sion was made into the urethra at that part, and a calculus easily extracted. The uneasy symptoms quickly disappeared, and the patient recovered with a small fistula at the incised part, which could have been removed without difficulty, had not the introduction of bougies been obstinately resisted. The calculus resembled a prune in size, of a crescentic form, with one of the apices detached, and was apparently composed of uric acid, coated with the ammoniaco-magnesian phosphate. On making a section of it, about two-thirds of the brass curtain-ring, partially decomposed, were found firmly impacted in the centre. It would appear that a portion of the ring had speedily made its way into the urethra, had been acted upon and washed away by the urine; while the remainder coming more gradually in contact with that fluid, had become incrustated with deposit, and formed the nucleus of the calculus. It is strange that the penis should have been efficient,—that the erectile tissue should have remained pervious—after having been cut completely through near the symphysis.

Of Gonorrhœa Præputialis vel spuria.—By this term is understood discharge of puriform matter from the lining membrane of the prepuce, and from the surface of the glans, accompanied with an itching and smarting sensation. The affection may arise from mere inattention to cleanliness, the natural secretion being allowed to collect and deteriorate; or from the application of acrid matter, gonorrhœal, or leucorrhœal. It often attends discharge from the urethra,

and is usually met with in those who, from the natural tightness of the prepuce, uncover the glans with difficulty, if at all. It may occur without impure connexion ; mucous discharge accumulates, becomes acrid from stagnation, and is washed away by profuse secretion of puriform matter ; the parts then become quiet, and resume their healthy functions, but are apt from slight causes to be again the seat of discharge. Generally, the surfaces of the prepuce and glans are relaxed and turgid, but there is no breach of continuity ; in neglected cases there is superficial patchy ulceration, and sometimes a deep and sloughing sore. The matter is often confined by tightness of the præputial orifice, and mischief thereby occasioned to the glans ; a large purulent collection forms, and, if the case is neglected, ulceration takes place, either of the glans or of the prepuce, or of both ; the latter becomes thin, and at length gives way ; the aperture thus formed extends, and occasionally is of such a size as to admit of protrusion of the glans. Œdematous swelling generally takes place to a great extent in such cases. The glands of the groin sometimes swell, and through inattention may suppurate. The absorbents of the penis may also become turgid and painful. Tenderness of the glans and prepuce often exists, in a greater or less degree, for years ; in such circumstances the affection may be termed gleet of the prepuce, and is usually the consequence of irritable urethra.

The treatment consists in cleanliness and rest, applying astringent washes to the parts, and suspend-

ing the organ. When swelling of the prepuce or inflammation of the lymphatics is threatened, constant rest must be enjoined. In obstinate cases, disease of the urethra is to be suspected as the cause, and the state of that canal should therefore be ascertained; if derangement of structure or function is detected, then means must be forthwith adopted for its removal, the applications to the prepuce and glans being at the same time not neglected. Mercury can be of no use.

Phymosis and Paraphymosis are often connected with gonorrhœa of the prepuce, or of the urethra. The edge of the prepuce may be rendered tight by inflammation, swelling from effusion, or cicatrization of sores; the tightness also attends irritability of the urethra, particularly in young subjects; often it is congenital. The affection is termed *Phymosis* when the prepuce occupies its natural relative situation, but cannot be drawn back so as to uncover the glans. The contraction exists in various degrees; sometimes the orifice is so tight that the flow of urine is obstructed, the præputial cavity becoming swelled and distended every time the patient attempts to make water. In other instances the uninjected glans can be exposed either in part or entirely, though with difficulty. In consequence of the præputial cavity being frequently filled with urine, in cases of great contraction, urinary concretions have formed there or in the orifice of the urethra, giving rise to very annoying, and sometimes alarming, symptoms.

In consequence of Phymosis, the urethra and bladder may become diseased. It is often attended with profuse puriform discharge, with sores of different kinds, or with warty excrescences on the glans and prepuce; sometimes the whole surface is completely covered with granulated prominences of various sizes, some large, but the majority small, some broadly attached, others suspended by narrow necks; all generally furnish discharge of thin acrid matter. Adhesion may take place between the raw surfaces of the prepuce and glans, provided the parts be not frequently displaced for the purpose of ablution.

Paraphymosis arises from the same state of the orifice of the prepuce as the former affection, only the parts are in different relations to each other. In phymosis the prepuce covers the glans, and the tight part is anterior to it; in paraphymosis the prepuce is reflected over the glans, the tight part acts as a ligature round the penis behind the glans, and such swelling speedily arises in consequence of the constriction as to prevent reduction. The glans and lining membrane of the prepuce swell anteriorly to the stricture, the integuments of the penis swell behind, and the stricture is depressed and concealed between. The cellular tissue there is necessarily very loose, so as to admit of free motion and change of relative position, and consequently the engorgement is often very great. The infiltration is at first serous, and the swelling is easily compressed; but, from continuance of the inflammatory action, lymph is effused and becomes organised, and the turgescence is more

solid and unyielding. When the stricture is very tight, the patient cachectic and irregular in his mode of life, and the case injudiciously or inertly treated, sloughing takes place rapidly, or phagedenic ulceration occurs anterior to the stricture. But in most cases the prepuce is not so tight as to cause complete strangulation, yet obstructs the flow of blood sufficiently to induce swelling of the included parts, breach of surface more or less extensive, and an unhealthy appearance of the ulceration. The ulceration is generally in the neighbourhood of the stricture, at first limited and superficial, but increasing both in depth and extent—so long as the cause remains. The stricture is not situated anteriorly to the swelling, as has been supposed, but near its middle—where the tight orifice of the prepuce grasps the penis, and causes a depression in the swelling. On separating the anterior and posterior tumours, the stricture is readily exposed, though previously effectually concealed.

In slight cases of phymosis, the orifice may be dilated by frequent fomentation, and perseverance in withdrawing the prepuce as far as possible. When ulceration or secretion of matter has occurred, astringent injections, at first mild, and gradually strengthened, should be frequently thrown into the præputial cavity. Suspension of the penis should be enjoined, along with rest—of the whole body, as well as of the affected organ in particular. When much inflammation exists, antiphlogistic remedies must be put in force, followed by fomentations. In bad cases, the prepuce must be divided in order to expose the seat

of ulceration, morbid secretions, and vegetations. The preferable situation for incision is close by the side of the frænum, much less deformity ensuing than when the prepuce is divided either laterally or in front. The flaps are at first loose and flabby, but shrink as the œdematous swelling subsides. A straight director is introduced within the præputial orifice—the groove pointing downwards—and passed down to the reflection, close to the frænum; a sharp-pointed curved bistoury is slid along the groove till it also reaches the reflection; by raising the handle and pushing it forwards, the integuments are transfixed there, and withdrawal of the knife by a rapid sweep completes the incision. Care must be taken not to pass the director into the urethra instead of into the præputial cavity. It is very seldom that ligature is required to arrest bleeding. Should the cellular tissue of the divided part not have been the seat of solid effusion, the integument and the lining membrane of the prepuce separate, leaving a large raw surface; and to prevent this a small suture should be passed between the membrane and skin on each side of the wound; these may be withdrawn on the second or third day, the cellular tissue having then become consolidated, so as not to admit of retraction. A warm poultice is the best application for the first few days; afterwards healing of the cut surfaces may be promoted by the application of a gently stimulating lotion. Should œdema of the prepuce remain, this may soon be effaced by bandaging. By this operation sufficient space is obtained for uncovering

the glans, under any circumstances ; and besides, to this part of the organ is still preserved its natural investment, not in the least curtailed either in size or in efficiency—the glans can be uncovered and covered at will ; whereas by any other mode of incision the unseemly flaps always fall away, leaving the greater part of the glans constantly uncovered, and placing the patient, if not in a worse, at least in the same predicament, as if he had been subjected to regular circumcision.

There is danger in allowing the state of phymosis to exist long ; it has been already observed, that this condition of the parts predisposes to ulceration, vegetations, and morbid secretions ; but besides, experience has shown, that very many cases of cancer of the penis are attributable to phymosis, either congenital, or of long duration. In all cases, when the orifice of the prepuce is so tight as not to admit of exposure of the glans, the operation is expedient, the existing state of parts being very inconvenient ; but it becomes a matter of absolute necessity, when there are extensive sores on the prepuce or glans, when there is much tumefaction or hardening of the parts, when urinary concretions lodge in the præputial cavity or in the orifice of the urethra, when vegetations or warts form on the glans, and when the præputial orifice is so contracted as to seriously impede the flow of urine.

In paraphymosis there is a necessity for early interference, in order to save the organ ; indeed active and decided measures are as imperiously call-

ed for here, as in the case of strangulated hernia; and it ought to be remembered that the organ is one of importance, and that its loss would render most people miserable. To attempt relaxation by fomentations, and such like, is absolute folly; the stricture cannot yield to such remedies; and, from increase of swelling, strangulation will become more and more complete. Cold, too, is incapable of reducing the swelling; cold, or astringents, cannot possibly diminish the size of the vessels, whilst return of the blood in them is prevented by tight stricture; and so long as the stricture remains, the serous effusion cannot subside, but will increase. Besides, the application of cold will hasten the occurrence of gangrene, in as much as it tends to diminish the power of parts which are already in a weakly condition. The parts must be instantly replaced. With the fingers of the right hand, the surgeon grasps the glans, and by firm and continued pressure diminishes its volume, whilst with the left he endeavours, by steady pulling, to reflect the swollen prepuce over the glans, which he is at the same time pushing back, as well as lessening. By uniformity and perseverance in these manipulations, more than by any force, replacement will often be accomplished. He will be able to judge, from the duration of the disease, and from the appearance and feel of the parts, whether simple reduction, that is, without having recourse to the knife, be practicable or not. In some cases, particularly when gangrene is imminent, there is danger of twisting off the glans,

if attempts at reduction are injudiciously persevered in. When he is foiled in reduction, or deems the attempting of it imprudent, the stricture must be divided; and in this simple operation much error is often committed from ignorance of the nature of the disease, and of the relative situation of the parts. It is necessary to divide only the edge of the prepuce, which, from being reflected, alone composes the stricture. The anterior and posterior swellings are to be separated as far as possible, and, in the very bottom of the depression between, the stricture is exposed; a slight incision, a scratch, through this, either with the point of a bistoury, or with a lancet, is sufficient; the tight edge of the prepuce—the only part in fault—is divided, and then, by the process already detailed, reduction can be readily effected. After reduction, a minute notch in the extreme edge of the prepuce is the only deformity visible, except the swelling. But if, from ignorance of the true seat of the stricture, extensive incisions have been made, pretty much at random, the organ will be considerably disfigured—and that unnecessarily. By fomentations, rest, and low diet, the effusion will be dissipated in a very few days. Reduction is difficult when the contraction has continued for some time, and the tissues have become glued together by effused lymph.

Malignant ulcer, with induration of the surrounding parts, and contamination of the lymphatics, occurs occasionally on the glans penis, or on the lining

membrane of the prepuce. As before observed, it is most frequently met with in those who have laboured under congenital phymosis; in that state of the organ, its extremity is apt to inflame, swell, and ulcerate, in consequence of accumulation and acrimony of the secretions from the membrane of the prepuce: indolent swellings form in the groin; and in one case, I recollect, these assumed a malignant action, a frightful ulcer formed, and the patient was destroyed, after division of the prepuce, and after the ulceration on it had been long healed, and the part had apparently become quite sound. Early removal of the diseased part, by incision wide of the indurated and altered structure surrounding the ulcer, is the only means of saving the patient, of preventing glandular inguinal tumour, ulceration of it, hæmorrhage, hectic, and death. When the prepuce solely is involved, removal of it is sufficient, either entirely or in part, as circumstances may demand. When the glans and coverings, as also the body of the penis, are involved, amputation is to be performed, provided the lymphatics still appear unaffected. In this operation the integuments must be freely removed, otherwise the cut orifice of the urethra will be obstructed by their puckering and contraction during cicatrisation of the wound. With this view, the skin is drawn forwards and stretched by the left hand, and then with one sweep of a long knife a transverse incision is made at once through all the parts composing the organ. Two or three vessels by the side of the septum may require ligatures. The

skin retracts considerably, leaving the cut surface free; the wound granulates, contracts, and cicatrises. If diminution in the canal of the urethra be threatened during the cicatrisation, it is to be obviated by the occasional use of a short conical bougie.

Imperfections about the orifice of the urethra are by no means uncommon. Often there is a mere vestige of the orifice of the urethra in the natural situation, the opening being situated half an inch or a whole inch behind, and on the lower part—*Hypospadias*; in such cases the prepuce is generally short. Sometimes the urethra is deficient to a great extent, terminating immediately before the scrotum, or even behind it.

A child had passed no water thirty hours after its birth. The bladder was distended. The genital organs were imperfect; the urethra was wanting, and the penis was diminutive and abnormal. A small trocar was passed from the vestige of the orifice onwards, in the proper course, guided by the finger in the rectum. The urethra seemed to have terminated at the bulb; the canula reached this, and was retained for twenty-four hours. Afterwards the urine passed readily through the canal, partly natural, but principally artificial, and the power of retaining it became perfect.

In adults the hypospadias is inconvenient; the orifice is often contracted, and the whole parts are irritable; and the ejaculation of the seminal fluid is unsatisfactory to the parties concerned. The defi-

ciency may be repaired in some measure, when there is abundance of skin to spare, but no rules can be laid down for such irregular operations.

Imperfection of the urethra anteriorly, on the dorsum, is rare—*Hyperspadias*. The following is rather a remarkable instance—The man was aged 26, robust and healthy. The whole extent of the urethra anterior to the pubes was exposed superiorly, there being a wide fissure through the corpora cavernosa and glans. The penis was retracted considerably, so that the posterior part of the fissure lay beneath the symphysis pubis. The numerous lacunæ of the urethra were beautifully distinct, and the mucous membrane was seen covered by their secretion. When the patient made water, the urine, after emerging from beneath the pubes, divided into numerous small streams, some of which spread over the side of the penis, while others passed along the exposed urethra. The callous margins of the fissure, formed by the corpora cavernosa and glans, were carefully pared, and, a catheter having been introduced, the raw surfaces were retained in apposition by suture. The wound healed perfectly, almost entirely by the first intention; and the organ both looked well and proved efficient. The malformation was congenital, and was considered by the patient as analogous to harelip; but the story related to account for this was not very plausible.

The disease of the external parts of the male genital organs, commonly called *Chimney-sweeper's Cancer*, is one of a formidable and intractable nature, but

fortunately not often met with. The scrotum is the part usually attacked. A wart forms, generally at the lower part, assumes an irritable appearance, and quickly degenerates into open ulceration of a malignant character. The ulcer extends rapidly, consuming the neighbouring integument, and involving the testicle and other subjacent parts in induration and enlargement. The induration extends along the spermatic chord, and the lymphatics participate in the diseased action at an early period. The discharge from the sore is acrid, sanious, and possessed of much fœtor; sometimes fungi protrude, but more commonly the surface is excavated and smooth. Not unfrequently the skin surrounding the ulcer is studded, to a considerable extent, with numerous clusters of warts, of an unhealthy and angry aspect. The general health is soon undermined, and the disease advances from bad to worse with the usual certainty and rapidity of malignant action. It seldom occurs till after the age of thirty or forty; and though most frequent in chimney-sweeps, is not peculiar to them. No treatment can be expected to arrest its progress at an advanced stage; the only opportunity of saving the patient is at the commencement of the disease, when the affected part is small, and before the lymphatics have become involved. Local application and internal remedies are not to be trusted to; the part must be excised. An incision is made wide around the wart or ulcer, and the included parts are dissected away to a considerable depth. When the testicle has become affected, the chance of success is much diminished;

but still if the inguinal glands appear sound, and the chord tolerably free, castration is to be performed as the last, though desperate, means of eradicating the disease.

By *Hydrocele* is meant a tumour caused by accumulation of fluid either in the chord or within the cavity of the tunica vaginalis testis. It has been divided into diffused and encysted. By the former term is understood effusion and accumulation of serum in the cellular tissue, the cells gradually dilating to accommodate the increasing fluid, and ultimately becoming converted into vesicles of large size; the parts around are thickened and condensed. This affection is very rarely a local one, but almost uniformly combined with and forming a part of anasarca arising from constitutional causes. When the swelling proves troublesome, it may be diminished by drawing off the fluid through one or several punctures; free incision is attended with risk, and is besides unnecessary.

Encysted hydrocele of the chord occurs in children more frequently than in adults. The fluid is thin and clear, and contained in a distinct cyst, of a smooth, shining, serous appearance internally; this cyst may be either an unobliterated portion of the congenital spermatic process, or composed of thickened and condensed cellular tissue, strengthened exteriorly by the expansion of the cremaster muscle. The tumour is seldom large, usually of an oval form, and situated nearly midway between the testicle and groin; cau-

sing no pain, but proving inconvenient simply from its bulk and situation ; fluctuating, and sometimes partially diaphanous ; evidently circumscribed, the chord both above and below being natural to both sight and touch ; not altered by change of posture or by muscular exertion. Sometimes it encroaches both on the groin and on the testicle, but even then attentive manipulation readily distinguishes it from swellings connected with these parts. Discharge of the fluid by means of a small trocar and canula, not only dissipates the swelling, but often effects a permanent cure, particularly in young persons—the cyst either ceasing to exercise a secretory function, or becoming obliterated. If re-accumulation take place, the treatment is to be conducted on the same principles as in hydrocele of the vaginal coat.

Hydrocele of the tunica vaginalis is exceedingly common, particularly amongst labouring people, and occurs apparently with equal frequency at all ages. It is a gradual accumulation within the tunica vaginalis of a fluid partaking more or less of the serous character, furnished by the exhalants of that membrane and of the tunica albuginea,—but whether from excessive secretion or deficient absorption, it is difficult to determine. It is probable that the accumulation is the result of excited action in the part, for its origin is most frequently attributable to external injury—blows or bruises, followed by rapid swelling, which, after a time, subsides, leaving perhaps some enlargement of the testicle, or of the more superficial tissues, and succeeded by the gradual appearance of

the disease in question. Sometimes it is attributed to powerful and habitual muscular exertion, as in blowing wind instruments, lifting heavy weights, &c.; and perhaps the impediment to the venous return, so produced, may be the cause of the effusion. The accumulation, as already stated, is gradual, and consequently the formation of the swelling is proportionally slow. It commences at the lower part of the scrotum, and by degrees ascends, at first globular, afterwards of a pyriform shape; after it has attained a considerable size, the testicle cannot be felt in its usual situation, for it is now placed not at the bottom of the bag but towards its middle, and if the tumour be tense it can scarcely be felt at all. The raphe is displaced to the opposite side, the usual puckering of the scrotum has disappeared, and the tumour feels light in proportion to its size. On manipulation it is found yielding and elastic, and in all ordinary cases a distinct fluctuation is communicated to the fingers during alternate pressure. And by using the hand as a shade, the rays of light are made to permeate the swelling, rendering it more or less transparent according to the thickness and density of the covering, and the hue of the contained fluid. It is seldom that the distension of the vaginal coat is to such an extent as to reach the groin, consequently the spermatic chord is felt to be free, as also the inguinal aperture; and even when the swelling does reach so high, the upper part is the least tense, permitting displacement of the fluid and distinct perception of the chord. The patient complains of a sense of dragging and weight

in the parts, and of uneasiness and inconvenience during exertion, but seldom of pain. When large, the tumour is necessarily covered by borrowed integument, often so as almost entirely to conceal the penis. In almost every case the testicle is increased in size and indurated, and sometimes this enlargement forms a considerable part of the swelling. Occasionally the spermatic veins are varicose ; and this has been, by some, considered one of the causes of the disease. In cases of very slow increase, and in persons of advanced age, the vaginal coat is not unfrequently much thickened, so as to obscure the sense of fluctuation, and destroy the transparency of the tumour. Sometimes deposit of earthy matter takes place between the layers of the membrane, rendering it hard, rigid, and in a measure osseous ; in such cases cholesterine has been found in the contained fluid ; sometimes the cavity is intersected by membranous filaments, delicate and reticulated ; sometimes complete septa subdivide it into several compartments. The fluid is generally thin, albuminous, and of a straw colour ; in some cases paler, and coagulating on cooling, being gelatinous ; in others of a dark colour, probably from admixture of blood.

The treatment is either palliative or radical. The former consists in evacuating the fluid from time to time, according as the feelings of the patient demand it ; and in children this simple tapping is often successful in preventing return of the disease. The swelling is grasped from behind by the left hand, and compressed so as to render the middle and fore part tense

and prominent; into this a trocar and canula are plunged, piercing the coverings in a perpendicular direction, and then inclining the canula upwards, the stilet being partially withdrawn, so as to avoid wounding the testicle. When fairly passed within the cavity, the trocar is withdrawn entirely, and the fluid escapes through the canula—gentle pressure being employed towards the conclusion. The wound usually heals in a few hours. Various means of radical cure have been proposed—incision, seton, caustic, and the injection of stimulating fluids. Incision and the seton are now abandoned, and do not require notice. The application of caustic perhaps may prove efficient in children when tapping has failed, and in youths; an aperture is thus made, through which the fluid escapes, and at the same time considerable excitement is induced, which may prevent reproduction. I have made trial of it in several instances, and generally with success; but am now inclined to avoid it, having lately experienced much difficulty in keeping within moderate bounds the inflammatory action which succeeded its application. Injection is now generally practised; and if carefully performed, it is unattended with risk, and almost invariably successful. Various fluids may be employed—cold water, wine, wine and water, spirits, a solution of the sulphate of zinc, &c. I use pure port wine; and have scarcely ever seen its effects either excessive or deficient. I can remember very few cases in which the disease returned after this injection. Having ascertained that the testicle is sound, or but slightly enlarged—

for injection of the tunica vaginalis is incompatible with diseased testicle—the fluid is drawn off by means of a round trocar. The canula is left in the wound, and to it is adapted the nozzle of a brass stop-cock attached to a small elastic bottle. By means of these instruments the wine is injected in sufficient quantity to distend the tunic moderately, taking care that the extremity of the canula is completely within the cavity, otherwise the cellular tissue will be injected, and violent inflammation ensue, terminating in unhealthy suppuration and sloughing. By turning the cock, the wine is retained until the patient begin to feel pain shooting upwards to the loins, when it is to be evacuated. He may not feel any uneasiness, however, and then it will be necessary to draw off the fluid and inject a fresh quantity. If this, too, fail, a more stimulating fluid must be used, a solution of sulphate of zinc, spirits and water, or pure ardent spirits. It is supposed that this treatment is effectual by inducing adhesive inflammation, and obliteration of the cavity by adhesion of the tunica vaginalis to the tunica albuginea; but this is erroneous. There may in some cases be a little lymph deposited, but in general there is not. The excitement following injection seems to change the action in the parts without altering their structure or relation—to re-establish the healthy balance between the exhalants and absorbents. Its first effect is to produce increase of swelling from fresh effusion into the cavity of the tunica vaginalis, accompanied with redness of the integument and considerable pain—sometimes with

slight fever. This fluid, however, is quickly absorbed—usually in from four to six days—the swelling subsides, as also the pain, and the patient remains free of the disease. Whilst this salutary action is in progress, the recumbent posture must be strictly enjoined, along with low diet and suspension of the organ; and sometimes, though rarely, it may be necessary to have recourse to more active means to moderate inflammation. Should the excitement appear insufficient after a day or two, the parts may be rubbed with the hand, and gently squeezed, or the patient may be directed to walk occasionally through the room until pain is felt. If the disease return, as need scarcely be dreaded, injection is to be repeated, either again with wine, or with a more potent fluid.

The term *Cirsocele* is applied to varix of the spermatic veins. The affection seldom extends to the inguinal aperture, and is usually situated on the left side. The tumour is somewhat pyriform, the larger extremity resting on the testicle, and by its peculiar appearance and feel its structure is at once apparent; the veins are seen through the integument. Pressure from below upwards, during the recumbent posture, diminishes the swelling; pressure above augments it, particularly if the patient change his posture, and exert the abdominal muscles. Sometimes a dull pain in the back is complained of, relieved by suspension of the scrotum, and often wasting of the testicle slowly advances. In some cases the swelling attains

a large size, elongating the scrotum, and proving a source of very great uneasiness to the patient—so great that some have requested and urged castration. Commonly it is sufficient to wear a bag truss, and avoid all causes of irritation to the parts; thus increase of swelling is prevented, and the inconvenience rendered trifling. If pain, with redness of the integument, and additional enlargement, should supervene, rest and the recumbent posture must be enjoined for a time, combined perhaps with low diet and local depletion. But in cases of large inconvenient tumour, accompanied with atrophy of the testicle, rather than accede to the wishes of the patient and perform castration, the treatment recommended many centuries ago is to be put in practice—the application of a heated wire to the veins. The upper part of the tumour is grasped and made prominent, the veins are separated as much as possible from the other parts composing the chord, and a small-pointed cautery, a glover's needle, for example, is inserted at several points. This is followed by some pain, and increase of swelling. Inflammation and obliteration of the veins is produced at the cauterised points, the swelling gradually diminishes, and ultimately a dense chord is all that remains. The cure is radical, and I have never seen the effects prove too severe. Rest and antiphlogistic regimen are of course necessary for some days after the application; abstraction of blood will seldom be required.

Hæmatocele is an effusion of blood, either into the

cellular tissue of the scrotum, or within the tunica vaginalis, or in both. It is generally the consequence of a bruise or wound. From the loose nature of the cellular tissue, the effusion into it is apt, if proper attention be not given, to take place to a great, and to the patient and friends alarming extent. This I have witnessed after the operation for hernia, and after removal of the testicle—bleeding from some small artery continues, the blood is by dressing or pressure prevented from escaping externally, it is consequently extravasated into the cellular structure, giving rise to tumour; and in some cases this swelling, occurring after the operation for hernia, has been mistaken for redescend of the bowel. The blood must either be absorbed or discharged. Absorption is the more safe and desirable, but necessarily tedious, and more or less thickening and enlargement may remain for a long time. Discharge, whether spontaneous or by incision, is usually followed by unhealthy suppuration of the infiltrated and partially broken down cellular tissue, sloughing of it, tardy separation of the dead parts, and tedious, perhaps exhausting, flow of matter.

Hæmatocele of the vaginal coat may supervene on Hydrocele, in consequence of external injury; or bloody effusion may take place from the vessels of the membrane, from sudden abstraction of their customary support, after evacuation of the serous fluid, and whether injection has been resorted to or not;—as happens in careless tapping for ascites. Some of the diagnostic marks of hydrocele are thereby lost; there

is no translucency of the swelling, and fluctuation is either indistinct, or altogether imperceptible. The appearance of the contents varies according to the time which has elapsed betwixt their discharge and the occurrence of the extravasation; if short, coagula float in a thin bloody fluid; if considerable, the liquid is thick, dark, and putrid.

Bloody effusion into the scrotal cellular tissue produces a dark appearance of the integuments, and the swelling has a doughy feel. At one or more points, where the cells are broken down and much blood has collected, fluctuation is perceived more or less distinct. The treatment consists of rest, the recumbent posture, support of the swelling on a small cushion, and the employment of fomentation when the parts are painful. The absorption proceeds slowly; and after some time, when all painful feelings have ceased, stimulant embrocation may be used, with the view of expediting it; a solution of the muriate of ammonia, of the sulphate of alumina, or of other astringent stimulating salts, may be employed in strength proportioned to the feelings of the patient and the progress of the case. If the tumour suddenly become painful, and increase in size, indicating putrefaction of the blood, and commixture of it with puriform matter, a free incision is to be made, and poultices applied. When the parts have become quiet, and suppuration been established, poulticing is to be discontinued, and mild and light dressing employed.

When, on tapping a hydrocele, the fluid is found to

be bloody, injection is not to be resorted to, though the other circumstances of the case should appear favourable. Rest is enjoined ; and a radical cure is not to be attempted till the fluid has collected a second, or perhaps a third time, and become colourless.

Acute inflammation of the testicle, from sympathy with the urethra, and sudden suppression of discharge from the anterior part of the canal, has been already treated of. The inflammation may also be the result of external violence. When the urethra is diseased, the testicle is irritable, and its circulation easily excited. After subsidence of the inflammatory attack, swelling, particularly of the epididymis, or of the posterior part of the gland, seldom altogether disappears. The new matter is not entirely absorbed ; and thickening and induration remain, to an extent depending on the violence of the action and the propriety of the treatment.

Enlargements of the body of the gland are generally attributed to injury. But often they occur without such cause being assignable ; and may be the result of chronic excited action, kindled in deposit produced by a previous acute inflammatory attack. Such indolent swellings attain considerable size. The tumour is of an irregular surface, and feels hard and unyielding ; there is always more or less effusion of fluid into the cavity of the tunica vaginalis, adding to the bulk of the swelling. Indeed, the size and consistence of the tumour can be correctly ascertained only after evacuation of this fluid.

Many of these tumours, as already observed, are of firm consistence; others are soft and doughy. They occur at the middle period of life, or before it. Some are resolved easily, and by ordinary attention. Others enlarge, notwithstanding the most judicious treatment; they gradually soften, and at length fluctuation becomes apparent. Curdy matter is evacuated by incision, perhaps mixed with a small quantity of thin unhealthy matter; and from the wound projects a pale fungous growth furnishing profuse discharge. The gland has now lost all appearance of its original structure; a section of it presents a homogeneous surface, of a greyish colour, and soft consistence, at some places broken down and mixed with pus. The fungus is of the same nature as the rest of the tumour, but softer, and often with puriform depots in its base. In this disease there is nothing malignant; it occurs in people of impaired or originally weak constitution, and is generally known as the *scrophulous testicle*.

In the more simple swellings, the gland at some points retains its original texture, but the greater part has no tubulous appearance, and seems to consist principally of lymphatic deposit, dense, pale, and equable; the tumour, in short, is a simple enlargement. Such often accompany and are attributable to a diseased state of the urethra,—part of the canal being in an irritable and contracted state; and all efforts to discuss them usually prove fruitless, unless the urethra have been previously restored to a healthy condition. The soundness of this canal is

therefore to be enquired into in the first instance, and if stricture, or irritability independent of contraction, be discovered, the practice must be directed towards it. The urethra being sound, counter irritation is to be applied to the testicle; and the part should be suspended, though not in function altogether; walking exercise, and the friction which it occasions, must be avoided as much as possible. A gum and mercurial plaster protects the part, and induces a moderate irritation of the surface usually sufficient to dissipate the swelling slowly; if ineffectual, either repeated blistering, or the insertion of a seton in the integuments, may be had recourse to—from either or both much benefit is often derived. In obstinate cases the recumbent posture must be enjoined. In general, slight enlargement and induration of the epididymis remains.

The scrophulous swelling does not often yield to the means for discussion, but advances to suppuration. The abscess is to be opened, and the unhealthy contents discharged; endeavours are then to be made to effect closure by granulation, and after that counter irritation may dissipate the tumour, or at least diminish its size. If protrusion occur, as generally happens, it may be cut away; and by then keeping the granulations on a level with the integument, either by pressure or escharotics, at the same time attending to improvement of the general health, cicatrization may be procured, though tedious. Or escharotics may be used from the first, instead of the knife. For example, powdering the fungous surface occa-

sionally with the acetate of lead, I have found in several instances effectual; repeated sloughing of the protruded matter takes place; it sinks to the level of the integument, and ultimately below it, and then the employment of stimulating dressing induces contraction and closure.

Not unfrequently the testicle is attacked by swellings of a more serious nature—medullary sarcoma is common, as also both fibrous and soft tumours, with cysts; schirrus is more rare. These morbid alterations may take place at once—that is, the swelling may be from the first malignant—or they may supervene on tumours originally simple and benign. The tumour increases with the usual rapidity; to describe minutely the successive stages, would be but repetition of what has been already stated more than once, in treating of similar diseases in other organs. The medullary tumour often attains a very large size before the integuments give way; it may in some cases be mistaken for hydrocele, unless the history be attended to, and careful manipulation made; elasticity must not be confounded with fluctuation. After ulceration has taken place, the formation of a bleeding fungus is not uncommon; indeed, the testicle is the most frequent seat of fungus hæmatodes. The inguinal glands are in general affected early, and swell to a large size, ulcerating extensively, bleeding, and throwing out fungi; not unfrequently the chord feels free and soft, appearing a healthy structure between the inguinal and scrotal swellings. In the advanced stages of schirrous testicle, the chord and its integu-

ment are thickened and hard. The progress of this tumour is slower than that of the medullary, but equally certain. The cystic sarcomata, when fibrous, may remain long apparently in an indolent state, and without affection of the lymphatics; but when soft, the cystic contents are often bloody, the medullary matter soon breaks down, and then the integuments yield, and the malignant advance is rapid. It need scarcely be observed, that in such cases nothing but the knife, used at an early period, when the tumour is yet latent and the lymphatics uninvolved, can save the patient. Castration must be performed; and even this is in too many cases insufficient to annul the malignant disposition of which the parts have become the seat. As already stated, it must be had recourse to before hard and knotted swelling in the groin, with thickening and induration of the chord, has commenced, otherwise it can be of no avail.

The patient is placed recumbent. An incision is commenced a little above the inguinal aperture, and carried downwards; on reaching the tumour it is inclined to one side, so that with a similar one on the opposite side an elliptical portion of integument may be included. One straight incision might be sufficient for removal of the tumour: but in most cases it is necessary to take away more or less skin, that a large, loose, and flabby bag may not remain after the extirpation. This preliminary wound penetrates only through the skin and cellular tissue, and should be made rapidly. At its upper part the chord is then to be cut down upon, exposed, and divided; but the

division should not be made until the chord has been isolated for some distance, so as to afford a firm hold to an assistant, and not before the assistant has secured it firmly in his fingers, otherwise it may retract within the inguinal canal, rendering the bleeding from the spermatic artery troublesome. The dissection is now to be continued downwards, rapidly, and yet cautiously; the tumour is detached on all sides, and removed along with a sufficient quantity of integument. In dissecting off its posterior surface, care must be taken not to wound the septum of the tunica vaginalis. All adherent skin must be taken away, and in the case of fungus, the incision of the integument must be wide of the projecting part. But, at the same time, unnecessarily extensive removal of skin is always to be avoided, otherwise there will sometimes be a difficulty in covering the root of the penis and the remaining testicle. The assistant has, during the extirpation, retained his firm grasp of the chord, so restraining hæmorrhage from that quarter; now the branches, generally two, of the spermatic artery are pulled out by the forceps, and a ligature applied to their extremities, inclosure of any of the surrounding parts being studiously avoided. To tie veins, artery, nerves, vas deferens, and cellular tissue, in one mass, would lead to most serious mischief, not to mention the immediate and excruciating pain occasioned. It has been recommended either to pass a temporary ligature round the chord, before its division, to prevent retraction, or to tie the artery before it is cut across.

I have never found either practice necessary ; the latter retards the operation ; the fingers of an assistant are generally as effectual as a ligature, and inflict less injury to the parts and less pain to the patient. Should the chord slip, there can be but little difficulty in pulling down the artery by means of a hook ; at the worst, slight extension of the incision upwards may be necessary. The scrotum is to be sponged clean of coagula, and its bleeding vessels secured ; often they are numerous. The incision is brought together by several points of suture, and cold cloths applied. In no operation is secondary bleeding more frequent, occurring within an hour or two after reaction has been established, and the patient begun to get warm in bed. The flow is always from the scrotal vessels in the lower part of the wound, and often profuse. The dressing must be partially undone, so as to expose the vessels, and permit of the application of ligature. On this account, it is well not to approximate the lower part of the wound in the first instance, but to fill the cavity with charpie or dry lint, retaining this until risk of hæmorrhage has passed over, and then to bring the edges together. The upper part of the incision often heals by the first intention, but this is seldom effected in the lower ; suppuration takes place, and the cavity fills up slowly by granulation. Indeed, attempts to procure primary union of the scrotal wound are scarcely to be recommended ; they are very seldom effectual ; and should bleeding take place, the patient is either

put to much pain, by removal of the stitches, and separation of the edges, or the blood is confined, accumulates in the cavity, and is infiltrated into the cellular tissue, producing much tumour, which terminates in extensive and unhealthy suppuration. Such retardation of the cure is avoided by open dressing of the lower part of the wound from the first.

Not unfrequently infiltration of the cellular tissue over the chord takes place within a few days after the operation, extending upwards under the superficial fascia of the abdomen, with discoloration of the integument, diffused doughy swelling, and much irritation of the system. The matter soon collects at one or more points. Early incision will check the advancement of this affection, followed by fomentation and poultice, and attention to the constitution. Collection of the matter should never be waited for; and when depôts have formed, a free and dependent opening should be made early. Sometimes the patient may perish, exhausted by the profuse discharge and the disturbance of the system, in cases that have been neglected, or in which infiltration is rapid and extensive and the powers of life weak.

Calculus Vesicæ. Morbid action of the kidneys, producing altered secretion of the urine and deposition from it, takes place in consequence of derangement of the digestive organs—often occasioned by the free use of acids, or of ascenscent diet or drink. Many causes, which have not as yet been well ascertained or understood, seem to influence and predis-

pose to calculous disorders. The prevalence of these affections in particular districts has been attributed to the quality of the water, or to the use of peculiar food or beverages; but such opinions, in all probability, have been adopted neither on very good grounds, nor after due enquiry and consideration. The county of Norfolk, and the eastern part of Scotland from the Frith of Forth northwards, are districts very similarly situated, exposed to cold and piercing winds, and appear to furnish a greater number of cases of stone than the rest of Great Britain, with Ireland to boot. The reason of this, as already stated, has not been satisfactorily explained. But the disorder seems also to adhere to families, to be transmitted from one generation to another. Some children seem almost to come into the world labouring under calculus. The symptoms are noticed very soon after birth, and often patients are presented to the surgeon at the tender age of twelve or eighteen months.

The depositions from the urine are various. The deposit chiefly affecting children is of a dark colour, dense, hard, and crystallised; but one lighter coloured, and more friable, sometimes precedes the formation of this dark concretion. The dark sand or stone is occasionally, though much more rarely, met with in older individuals; but in them the red, dark brown, yellow, and white deposits are more common. And, in them too, the diathesis or disposition to the formation of one or other variety evidently alter-

nates, as is well demonstrated by section of urinary concretions.

The red deposit, by much the most common, at least in adults, consists principally of uric acid, soluble by solutions of the alkalies. The brown and yellowish are also composed of uric acid, often in combination with a base, and are likewise soluble in alkaline solutions, or in alkaline carbonates. The white is most commonly the ammoniaco-magnesian phosphate, soluble in acids; rarely, it consists of phosphate of lime, not so white or friable as the preceding, but likewise soluble in acids; or it may be a compound of phosphate of magnesia, ammonia, and phosphate of lime, very white and soft, and imparting a stain to the finger, soluble in acids, but principally characterised by its fusible property. The dark, hard deposit, chiefly occurring in children, consists of the oxalate of lime, either pure, or in combination with one or other of the preceding, very dense and soluble in acids. When these, by accumulation within the bladder, are formed into concretions, they are always mixed with more or less of a peculiar animal matter deposited from the urine. Passed by the urethra, and settling at the bottom of the vessel as the urine cools, they are termed either morphous, or amorphous, according as they are crystallised or not.

To correct the calculous diathesis is an object of much importance; solution of a concretion in the bladder is now allowed to be impracticable. The principal attention is to be directed to the digestive organs; these must be brought into a sound state by

attention to diet, and the exhibition of laxatives, tonics, antacids, &c., as the individual case may require. And much benefit is also derived from the use of either alkalies or acids in solution, according to the nature of the deposit. The uric acid diathesis is the most frequent; in that, alkalies, as the carbonates of soda or potash, are to be employed; the potash is preferable. Diuretics and diluents are useful in carrying off the sand, and relieving the painful symptoms; venice turpentine with squill is on this principle often a valuable remedy, and in some cases colchicum proves of benefit.

The symptoms attendant on the collection and passing of sand, or gravel, as it is commonly termed, are—pain in the loins; heat in making water; heat in the urethra occurring afterwards, continuing for some time, and usually at the orifice; frequent desire to empty the bladder; and an occasional mixture of blood with the urine. When aggregations of the deposit, forming concretions of some size, pass along the ureters, violent pain is felt in the course of these tubes. Often the patient complains of colicky pains all over the abdomen, and of sickness without vomiting. There is pain in the thighs and testicles, with retraction of the testicle on the affected side.

The calculous deposit may, instead of passing off along with the urine, be accumulated in the body, forming concretions. It is produced by the kidneys, and in them the concretions may be formed and lodged; or it may not accumulate until it has reached the bladder. Usually the stones are produced in the

former situation, and after having attained some size descend by the ureters, causing much pain. It is not often that they remain in the pelvis or infundibula till they have become too large to descend ; in such cases they increase in their original situation, producing, in general, much more uneasiness than had they reached the bladder. Or they may enter the ureters, and lodge in these canals, distending and obstructing them.

The concretions may be caused by the lodgement of extraneous substances in the urinary passages. Foreign bodies introduced, even in the most healthy persons, are soon incrustated by calculous matter ; and the rapidity of the incrustation is in proportion to the tendency to the calculous diathesis. At first the deposit is generally of a brownish colour. Catheters retained in the bladder are soon blocked up by it. Needles, bodkins, leaden bullets, seeds of vegetables, kernels of fruit, &c., have been found forming nuclei to urinary calculi—more frequently in females than in males, for obvious reasons.

Some concretions are formed on the nucleus of condensed vitiated secretion from the mucous coat of the bladder, and partly consist of this deposit from the membrane. Such are generally of a dirty white colour, soft, friable, small, and numerous ; it is seldom that they are collected into masses of any considerable size. They are usually adherent to the mucous membrane, sometimes forming a broad and thin sheet covering it extensively ; other stones, though composed of calculous deposit from the urine,

are equally friable as the preceding, and also both numerous and small. So brittle is their structure that they frequently break up by rubbing upon one another, or by being compressed one against another by the action of the muscular coat of the bladder. Their laminæ in fragments, and the nuclei entire, are, in consequence, often evacuated along with the urine in considerable numbers.

It has been elsewhere noticed, that cysts are apt to form in bladders which have been long subjected to irritation from any cause; it need therefore excite no surprise that such formations should be found in patients afflicted with calculous disorders. In one of these unnatural cavities a stone may lodge, both at first small. The concretion receives gradual increase, fills the cyst completely, and then dilates it in proportion to its own enlargement. So long as it is covered by the cyst, the patient suffers but little from it; but when, from the addition of calculous matter, it projects through the opening of the cyst, coming in contact with the coats of the bladder during contraction of the viscus, the usual symptoms of stone are manifested. Sometimes there are several encysted calculi in the same bladder, but in such cases they are seldom of large size.

The stone in the bladder—whether formed in the kidney, and having descended, or originally concreted in the bladder, either spontaneously or in consequence of the presence of foreign matter—produces very marked and distressing symptoms. There is frequent desire to empty the bladder, and the uneasiness

is not relieved by doing so. There is pain during and after the evacuation, referred to the course of the urethra, particularly to the orifice. In children, the patient is induced by the pain to grasp the penis, and pull forwards the prepuce, often so habitually as after a time to cause considerable elongation of the latter part. The flow of urine often stops suddenly, and immediately afterwards the pain is unusually severe; the stream reappears on change of position. The body is usually inclined much forwards during the attempts to make water; sometimes the patient rests on his knees and elbows, or on the top of his head, having found that he obtains most ease in these postures. The urine is mixed with ropy mucus, and in long-continued cases with a puriform fluid. After exercise, or unusual exertion, the urine is bloody. A bearing down pain is complained of during the making of water, and often there is simultaneous and involuntary evacuation of the contents of the rectum; the close sympathy between the bowel and the bladder has been already adverted to. In young persons afflicted with stone, prolapsus of the anus is common, and sometimes it occurs also in adults. Occasionally there is pain in the testicle, or in the back of the thighs, and very frequently a burning heat in the hollow of one or both feet; sometimes there is a fixed pain in the last situation.

Some of the symptoms are more prominent than others, and the severity of these also is not uniform. At times the patient is tolerably free from uneasiness; but then a fit of increased suffering supervenes,

often attributable to intemperance, or to over-exertion. The intensity of the symptoms also depends on the nature and size of the concretion, and on the idiosyncratic irritability of the patient; in some people the bladder is naturally so acutely irritable as to be thrown into the utmost disorder by the most trifling cause, whilst in others sources of greater irritation produce but very little uneasiness. The mulberry or oxalate of lime calculus is of very rough surface, and gives rise to the most violent symptoms. But the projecting portions of this, or of other rugged concretions, may become covered by additional and smoother deposit—or the surface may become smooth, polished, and water worn, receiving no addition for a long time—and in such circumstances the sufferings are mitigated. However, in consequence of fresh incrustation, they may soon become again much aggravated, and almost intolerable.

The increase of the stone is in some cases exceedingly slow; after many years, the size may not exceed that of half a walnut. In others, large dimensions are attained within a short period. The mulberry is always of gradual formation; and the rapidly increasing are generally of the alternating character.

The symptoms above detailed—many, and sometimes all of them—may be produced by other causes than stone in the bladder. Irritation of the bowels, more particularly of the lower, by worms, foreign bodies, or fæculent matter of a bad kind—irritation

of the kidney—alteration of structure in the kidney, and the lodgment of concretions in its pelvis,—are all attended by many of the symptoms of vesical calculus. Irritability of the bladder, the nature of which has been elsewhere detailed, also possesses somewhat similar indications ; but the pain is usually referred to the hypogastric region and the perineum, as well as to the point of the penis, perhaps more frequently, and is generally relieved after evacuation of the urine—such is not the case in calculus.

The symptoms of stone, when severe, will lead the patient to take such means as are necessary to ascertain the cause of them—to ascertain whether or not stone exists in the bladder. The term *sounding* is applied to such examination. In this proceeding the bladder should contain some urine, so that the object may be effected more readily, and with less pain to the patient ; he should be desired to retain his urine for one, two, or three hours, as he may be able. In the contracted state of the viscus, the stone may escape detection, if of no great size, from being embraced by the bladder, and concealed in its folds ; or, on the contrary, it may be discovered either after or during evacuation of the urine, having eluded the surgeon's search during an over-distended state of the viscus. Also, it may be discovered in one position of the patient, whilst it is lost in another. When the symptoms are decided, examination is to be made, both during the recumbent posture, and during the erect with the body bent forwards, and likewise with the bladder in various states of fulness ; and if

unsuccessful, the search is to be repeated. But in general no difficulty is experienced in discovering the stone. The instrument used should be pretty large, with a smooth metallic handle, and either with a large curve and long point, or straight till near the farther end, and then having a short curve. The latter form is preferable, as admitting of the curved part being introduced completely within the bladder, and turned in all directions and into every part of the viscus—the urethra being brought into a straight line by the remaining part of the instrument. The posterior fundus, behind the prostate, is the situation most commonly occupied by the stone during the recumbent posture; and there it is in a measure concealed, when small and the gland enlarged. The surgeon, aware of this, examines that part of the organ very carefully, and, as already stated, explores every corner with the utmost gentleness, and at the same time minutely, never employing the slightest force or rudeness of search. Upon bringing the instrument in contact with the foreign body, or moving it quickly upon it by turning the handle, the sharp, clear sound of the stroke can be distinctly heard; and this is one reason why the instrument should be throughout metallic. The prudent surgeon is not satisfied of the existence of calculus in the bladder, without this sign.

Not a few practitioners have been deceived, and have subjected their patients to incision of the bladder when no stone was there. A false and deceptive grating is sometimes felt during the passage of the

instrument through the prostate ; or the point may be made to rub against dense and rough fasciculi of the bladder ; or a more distinct feeling, as of stone, may be communicated from the instrument being brought in contact with particles of sabulous matter entangled in mucus, and adherent to the inner coat. The last deception is to be expected only in those advanced in life. But the greater number of those cut unnecessarily have been young persons. In them the symptoms of stone are closely simulated by irritations of the alimentary canal, and the crying of the patient prevents the stroke on the stone from being distinctly heard.

Perhaps the practitioner may be very anxious to discover a stone and have the glory of removing it, and is satisfied with feeling a rubbing or grating of the instrument ; he cuts into the bladder, and to his dismay and discomfiture nothing is found. No foreign body may have existed ; or perhaps some small particles of sand which gave rise to the feeling may have escaped detection, being carried off along with the urine and blood. On the contrary, cases have occurred in which a stone actually existed, but was overlooked ; and the patient, after recovering from the first incision, has been relieved by a second and better conducted operation. In diseases of the urinary organs, the surgeon cannot be too cautious and considerate in all his proceedings and interferences. For example : I went to see an operation for stone in the bladder, and was asked to feel the stone, but could not. There was merely a sense of

grating during the introduction of the instrument ; and the operator was dissuaded from his intention. The patient did not live many weeks ; a small ulcerated cavity was found in the situation of the verumontanum, but no stone.

By a dexterous use of the sound the size of the foreign body can be tolerably well judged of, as well as the state of its surface, and it may also be known whether there are more stones than one. The bent part of the instrument is passed over and beyond the calculus, and then under it, so as to ascertain its thickness ; and by moving it on each side, the other dimensions are also arrived at. No information can be obtained as to the size of the stone—at least in adults, and when it is not encysted—from any examination by the rectum.

Concretions resembling horse beans in size, and even larger, can be brought through the adult urethra without incision, by means of properly constructed forceps. The facility with which this is accomplished will depend much on the state of the passage, whether naturally capacious and free from morbid contraction or not, and also upon the condition of the prostate gland. Notwithstanding the greater irritability of the parts in young persons, this operation may be readily performed on them ; on several occasions I have removed from children concretions of considerable size through the natural passage. Various contrivances have been used for the purpose. Modifications of what are called Hunter's forceps have been recommended,—two elastic

blades shut by being withdrawn into a canula, and made either straight or curved; but they are not so applicable as the forceps of Weiss. These are of different curves and sizes, and the handles should be made of iron, smooth on the flat surfaces and roughened on the edges; for thus the concretion will be more readily felt. The instrument is passed along the urethra, and used in the bladder as a sound; when it has touched the stone the blades are opened, and by raising the handle, pressing the convex part downwards, and then allowing the blades to close slowly, the concretion is embraced. If the stone lie on the forepart of the instrument, on its concavity, it will fall between the blades as soon as they are sufficiently separated. By observing whether or not the wire goes home into the canula, it is ascertained whether or not the foreign body is between the blades; if it is not, the manœuvring must be repeated; if it is, the instrument is to be withdrawn carefully—of course bringing the concretion along with it. Some slight resistance is felt in passing the prostate, as also anterior to the sinus; and on reaching the orifice, some little force is requisite to complete the removal, or the orifice may be dilated by a slight incision so as to facilitate the disentanglement of the forceps with the concretion. By one or more operations of this nature many stones may be removed, and the patient thus freed entirely from the disease. There is no great risk of seizing and pinching the coats of the bladder with this instrument, whilst there is a tolerable certainty of doing so with most of the others.

On one occasion, when operating on the dead body, I found that the instrument had got several stones in its grasp, and was kept so dilated as to be withdrawn with much difficulty—there being no means of disentangling the stones but by farther expansion of the blades, which was impossible. A great many foreign bodies—pieces of pebble—had been introduced; but had the same number of urinary concretions been laid hold of—which is scarcely possible—those farthest from the point and most compressed would have crumbled down, and thus the expansion of the blades would have been diminished. I have experienced not the least difficulty in operating with this instrument, in numerous cases, and at all periods of life. The safety of the proceeding is its greatest recommendation. It is very seldom that any unpleasant symptoms follow; there may perhaps be a trifling effusion of blood, and some slight pain in making water may continue for a day or two. Should either irritability of the bladder, or symptoms indicating inflammation of the mucous coat supervene, these must forthwith be combated.

Concretions of such a size as cannot be made to pass through the neck of the bladder, and along the urethra, and yet are not much larger than a filbert, may, if soft and friable, be laid hold of in the bladder by properly contrived instruments, and acted upon so as to be reduced to powder and fragments, which may either pass off along with the urine, or be extracted by means of forceps. This proceeding is not advisable in children, owing to the small size of the

parts and their greater irritability, and in consideration also of the concretions in them being in general exceedingly dense; as formerly noticed, they are most frequently composed of the oxalate of lime. In the adult, it cannot be adopted with safety and propriety, when the bladder is irritable and will not bear a certain degree of distension, and when the prostate gland is large. The cases in which the concretion is small, soft, or brittle, and the parts sound and free from irritation, form but a small proportion of those labouring under stone who present themselves to an operating surgeon. However, the bruising, grinding, and rubbing down of stones has been tried in all kinds of cases, but with neither a satisfactory nor an encouraging result; a case will now and then be met with favourable to these proceedings, but they can never become generally applicable, and attempts to make them so will, as experience has shown, be followed by disappointment and disaster.

A stone of a larger size than I have indicated, and of dense structure, may be laid hold of in the bladder, and may by repeated and tedious operations be broken into fragments; but each sitting, as it is called, of the patient, and each attack upon the stone, is attended with more pain, greater risk, and far more exhaustion, than its removal by incision would inflict. The repeated introduction of the instruments, their expansion, and the turning of them about in the bladder, and, if their object is accomplished, the action of the angular and rough surfaces of the fragments on the mucous coat, are certainly followed by

an attack of inflammation of the viscus, always tedious and annoying—often excruciating, dangerous, perhaps fatal. Attacks of inflammation of the testicle are also not uncommon, probably from irritation of the prostate, and from the pinching and bruising of the verumontanum, which it is almost impossible to avoid, whatever care and precaution be adopted. In turning to the records of *Lithotrity*—and under this term we shall include all attempts to break down stones within the bladder, whether by drilling, or filing, or hammering—it will be found that many patients have died from the mere exploration; and altogether, nearly a half of those who have fallen into the hands of the experimenters and adventurers have perished in consequence. Every successful case is well advertised; the dead men rest in peace.

The operation of breaking up a stone in the bladder is very advisable in certain cases, and may be resorted to with every prospect of a safe, speedy, and successful conclusion. But it can be recommended and employed only within certain limits; the case must be well chosen, and every circumstance must be perfectly favourable as regards the condition of the urinary passage and of the bladder, and the size and nature of the stone. Every operating surgeon should make himself well acquainted with the instruments and their mode of application, so that he may resort to them as occasion requires.

A great deal of ingenuity has been expended of late years in inventing and improving upon the ap-

paratus. Many useless, inapplicable, and highly dangerous machines have been produced, a few efficient and perfectly safe. The three-branched instrument of Civiale takes its place at the head of the latter class.

The knowledge of the fact that the curvature of the urethra can be effaced, and a perfectly straight instrument passed into the bladder with equal facility and freedom from uneasiness as a curved one, has facilitated very much the application of means for seizing and acting upon a stone in the bladder.

The three-branched instrument, which it is unnecessary to describe, as it can be readily seen and obtained, can be without difficulty brought in contact with the stone, the bladder being partially distended by urine, or filled to the requisite extent by tepid water injected through the outer canula of the apparatus. The branches are then so far expanded, and the drill withdrawn; and by a little cautious management, turning the instrument, altering the degree of expansion, and sounding with the drill, the stone is seized, and then fixed by pulling back the inner canula. By turning the drill with the fingers, and pulling back forcibly the inner canula so as to close the branches, the concretion may at once be pulverised; or it may be again seized, and attacked by the drill on a different side. The operation may, if necessary, be repeated after the lapse of eight or ten days, or sooner if the irritation caused by the former have subsided. Diluents are to be given so as to facilitate the washing out of the detri-

tus, and strict rest and abstinence from stimuli must be observed for a few days

Various forms of drill have been contrived for acting on a large surface of the stone ; others for scooping it out, the shell to be afterwards broken into fragments and triturated ; they are unsafe and ineffectual. The instrument is also so constructed that a drill-bow may be used, and the apparatus may be fixed by what mechanics call a bench, or it may be attached, by complicated machinery, to the table on which the patient is laid, and be there secured in a proper position. But all this implies an intention of attacking large and dense stones, and a repetition of the attempts. So far as my experience goes,—and besides having seen Civiale and others operate, I have myself employed the instruments in a good many cases, and in some successfully,—I should dissuade from all endeavours to rid the patient of stone by such means, unless its size and consistence were such that it would yield to one or two attacks, and to the drill set in motion by the fingers.

A plan of crushing the stone, by forcing one part of an apparatus against another by the stroke of a hammer, has been lately promulgated, and by a person who previously maintained that the grinding and rasping was quite perfect, though now regarding them as nought. This percuteur has a short bend at its farther extremity, one half separates from and slides on the other, and both are provided with teeth. It is very possible to entangle a portion of the bladder betwixt its blades ; and, besides, these may bend

or break, as they have done in one abominable case, in which incisions were required to disengage the instrument from the patient's urethra or bladder. Also, a stone may be laid hold of by the apparatus, and being so hard as not to yield to the impulse of the hammer, may become fixed in such a way as it cannot be freed from the grasp, there being no provision for pushing it out as in the lithotriteur.

It will be seen from what has been stated, that I am not so sanguine—and I trust I shall be excused of presumption in giving an opinion upon the subject—as to suppose that the breaking up of the stone in the bladder will ever supersede lithotomy. That it would do so was at one time industriously represented, and perhaps believed, by some of the advocates and promoters of lithotrity. If, by some miraculous interposition, the deposits from the urine should uniformly be pulverizable, and the bladders be made of less irritable stuff than they are, and the affected individuals be prevailed on to apply in due time, then might such pleasant anticipations be entertained, and then might we with some reason hope to see them realized; but as matters now are, urinary concretions must, in the great majority of instances, be *cut* out of the bladder. Nor is it a circumstance to be very much deplored, since, in good hands, the patient neither endures so much suffering, nor incurs so much risk, as by the proceedings already detailed. The cure, besides, is far less tedious. The stone-grinders, whilst they conceal their own unfortunate results, endeavour to depreciate lithotomy by blazoning abroad the practice of some unlucky surgeon,

who, perhaps, loses four in twelve or six in twelve of the patients who come under his knife.

It has been said that lithotrity is applicable, when, from the advanced age of the patients and the rigidity of the parts to be cut, lithotomy is not. This statement is incorrect, at least the latter part of it. Old people, from 70 to 80, and even beyond, recover, when the operation is conducted quickly, without loss of blood, and so as to guard against infiltration, as certainly and rapidly as young persons.

Perhaps no operative procedure has been more canvassed than that of lithotomy. The subject has been discussed, and the operation attempted, by many not very eminently qualified. All sorts of contrivances have been made and promulgated in connexion with this operation; the greater number intended to supply the want either of anatomical knowledge or of operative dexterity. A volume would scarcely contain a catalogue even of the instruments which are in my possession,—crooked staffs, knives, spoons, and forceps. I shall content myself with describing what appears to me the most simple, safe, and certain procedure.

The bladder may be opened, for the removal of stone, in various situations; at its forepart, by incisions above the pubes; in the posterior fundus, by division of the sphincter ani and a portion of the bowel; at its neck, by cutting upon it through the perineum. The first mode is termed the high operation, the second the recto-vesical, the last the lateral. The lateral shall be first considered; it is the safest, the most advisable, and the most frequently resorted to.

Keeping the patient in suspense for days after operation has been agreed on, with the view of preparing him as it is called, is prejudicial. Unless his digestive apparatus be in disorder, or he be labouring under some other affection incompatible with the safety of operating, the sooner he is cut the better. Delay often inflicts much mental suffering, is apt to induce despondency, and to weaken the defensive and reparative powers of the system. On the night before the operation a dose of castor-oil, or other mild purgative, is to be administered, so as to obtain an empty state of the rectum ; should this fail, an enema must be given.

The existence of a stone should be ascertained immediately before proceeding to the operation ; it is not enough that the sounding was satisfactory the day before, or at any former period ; and the operator will also, for his own sake, satisfy those who are met as his advisers and assistants of the fact that there is a stone in the bladder. All apparatus that may be required should be at hand. A grooved staff, a knife, forceps, a scoop, and an elastic gum tube, are in general sufficient. A Read's syringe should also be provided, lest the stone should prove brittle and crumble under the forceps. When the operator has, by previous examination, ascertained that the stone is of an unusually large size, then he must be provided with a narrow, straight, and probe-pointed knife, with forceps of considerable length and grasp, and also with forceps so constructed as to effect crushing of the stone, should this prove necessary.

The staff should be curved, of a size sufficient to fill

the urethra or nearly so, and with the groove placed betwixt the convex surface and the side presented to the left of the patient. This form of instrument will prove the most convenient guide into the bladder. It is introduced fairly into the viscus, and made to touch the stone audibly. Its concave surface is raised towards the arch of the pubes, and retained thus, firmly hooked under the bones—as if with the intent of lifting the patient from the table—perpendicularly straight, without any inclination of the handle, or any bulging of the convexity towards the perineum. After being properly placed, the instrument is intrusted to an experienced assistant, who keeps it exactly in the same position from the beginning to the conclusion of the incisions. He at the same time elevates the scrotum, and, standing behind the patient, leaves the surgeon with both his hands at liberty, and with the patient's perineum all clear. The operator is thus enabled to guide the knife by the left hand; whereas, if he use a straight staff, his left hand must be solely devoted to the management of this instrument during the most delicate part of the incisions.

The staff is introduced either before or after the patient has been secured. The fixing of the patient is in this operation very necessary and important; on the proper management of that depends much the facility of completing the operation quickly and satisfactorily. Children are easily and conveniently held on the lap of an assistant, who, grasping the knees, places and secures the limbs so as to expose the perineum. In adults ligatures are indis-

pensable; the hands and ancles are to be fixed together by means of strong and broad worsted tapes; and, in addition, the pelvis requires to be secured, and the limbs must be retained well separated, by two steady and powerful assistants, pressing obliquely down towards each other. The patient is placed on a firm table of a height convenient to the operator, who is seated on a low stool. A table from two feet and a half to three feet in height, with a stool about a foot lower, will be found to suit very well. The instruments likely to be required are disposed in the folds of a towel placed on the floor, on the right side of the operator, and at a convenient distance.

Before proceeding to incise, the finger is introduced into the rectum to ascertain that it is in an empty state, and also to promote its contraction. A knife is used, with blade and handle somewhat longer than those of a common dissecting knife, and without an edge till within an inch and a half from the point,—held lightly in the fingers, the end of the handle resting on the palm. It is introduced close to the raphe, on the left side, and nearly opposite to where the erector penis and accelerator urinæ approach each other. Its point is made to penetrate through the skin, fat, and superficial fascia of the perineum, and is carried downwards with a slight sawing motion, by the side of the anus—about midway betwixt the anus and the point of the tuberosity of the ischium—and is continued till nearly past the lower part of the orifice of the bowel. The forefinger of the left hand is then introduced into the wound, and the resisting fibres of the transverse muscle of the peri-

neum, and of the levator ani, are touched with the edge of the knife directed downwards. Wound of the rectum is avoided by pressing it downwards and to the opposite side by the finger; indeed the finger should be constantly in the wound, as a guide to the knife. In this stage of the proceedings, incision upwards would be likely to interfere with the artery of the bulb, whatever its distribution may be,—whether the vessel come from the pudic, or from the posterior iliac. It occupies nearly the same relative situation in either case, and by care can always be avoided during the second incision. Division of it occasions most profuse, alarming, and dangerous hæmorrhage. I have seen the patient lose much blood in consequence during the incisions; and after the occurrence of reaction, have seen the blood soaking through the mattrass, dropping from the foot of the bed, and collecting in pools on the floor. The bleeding is difficult to arrest; the application of ligature is very troublesome, if not impracticable, and efficient pressure cannot be made with safety.

In my own practice I have had no hæmorrhage—chiefly, I believe, from never cutting upwards after the first incision—excepting one instance of secondary bleeding. The patient was sixty-one years of age, and had laboured under symptoms of stone for eight years. He had been dyspeptic for some weeks before the operation, but otherwise appeared a favourable subject. Very little blood was lost during the operation, but on the fifth day hæmorrhage occurred to the extent of seven ounces; on the eighth day, the same amount was lost; on the twelfth, a pound; on the sixteenth,

five ounces; on the seventeenth, about a pound. The bleeding was uniformly preceded by a feverish attack; and the blood had a florid, arterial appearance, and flowed rapidly. It proceeded from the interior of the wound, and a suppurating cavity in the neighbourhood of the prostate was felt by the finger. From the prostatic side of this abscess the blood appeared to spring; probably a considerable branch of the pudic ramifying in this situation had been opened by unhealthy ulceration. Pressure proved always effectual at the time, the hæmorrhage recurring on the loosening and separation of the lint. After the last bleeding the dressing was retained for some days, and on its removal no recurrence took place. The patient had been much exhausted by this severe loss of blood, but notwithstanding made a good, and by no means tedious, recovery.

Many patients have perished within the first day or two from bleeding, owing to the using of the knife too freely and in an improper direction. By very slight application of the edge to the resisting fibres, and by gentle dilatation with the finger, the membranous portion of the urethra is reached. The knife is passed over the back of the forefinger in the wound, and lodged in the groove of the staff; it is then carried forwards through the prostate, with the edge directed downwards and outwards, cutting the gland obliquely. In this incision the knife is raised very little from the groove, the object being to divide the gland to the extent of no more than barely three quarters of an inch. By so doing, the reflection of the pelvic fascia remains uninjured, and the boundary

is entire betwixt the external cellular tissue, and that loose and very fine texture immediately exterior to the bladder—betwixt it and the fascia lining the pelvis ; thus the risk of urinary infiltration is annulled, at least much diminished. There is great danger in dividing the base of the prostate completely, and much more in cutting any part of the coats of the bladder. When the knife enters the groove of the staff, this instrument must be held very steady ; if it be at all withdrawn, its point may escape through the wound, and mislead the knife.

There is no great risk of wounding the trunk of the pudic artery, unless by using either a broad instrument called the gorget, or a concealed knife. The former is now almost wholly abandoned. Besides endangering the pudic, it is apt to lacerate the neck of the bladder, pushing the prostate before it, and so tearing its cellular connexions. The latter, the lithotome caché, makes the internal wound larger than the external ; the coats of the bladder are slit up to an unnecessary extent, being cut much more easily than the prostate, and the instrument not affording sufficient resistance to the gland.

Through the prostatic opening the finger is easily passed into the bladder, and the stone felt. The staff is then withdrawn. Sometimes it is troublesome to reach the bladder with the finger, in consequence of the straining and struggling of the patient causing the organ to ascend in the pelvis ; the difficulty is overcome by patiently waiting till these exertions cease. By steady and gradual movements of the finger in the wound of the prostate, the opening is much

dilated, so as to admit of the ready introduction of instruments for laying hold of and removing the stone. Indeed, the neck of the bladder is capable of dilatation without any incision. In a case of perineal abscess containing a portion of exfoliated bone, on account of which incision was made, it was found that the cavity communicated with the urethra ; lest other foreign matter should remain, I introduced my finger into this aperture in the membranous portion, and found that by the most gentle movement I could not only easily reach the bladder, but dilate the opening in it to a very considerable extent.

By the finger in the bladder the size and position of the stone is ascertained ; and no extracting instrument should be employed till after the finger is in contact with the stone. When it is of moderate size, and after having been turned, if necessary, into the most favourable position for extraction, the forceps are introduced. This instrument should be tolerably long, so as to afford power in its use ; and the extremities of its blades should be covered with cloth, for thus it is not so likely to slip or to chip the stone as those with raised and projecting teeth. For flat stones, the forceps should be flat-mouthed ; for round, more open, hollowed, and bent ; or for the latter description of stone, forceps with a sliding joint may be used. The object is to lay hold of the concretion by as many points as possible—to bring a large surface in contact with the instrument. Those with the sliding joint are of no service when the stone is flat, as it either cannot be caught by them at all, or merely by their points, or near the joint ; it is applicable only to

round stones of considerable size. The instrument is introduced shut, along the finger, and on reaching the prostate is gently insinuated, whilst the finger is at the same time withdrawn. It is brought in contact with the stone, and carefully opened, the handles being raised. One blade is passed under the stone, the other remaining above, and then the instrument is closed, firmly but not forcibly. By the finger, again introduced, along the side of the forceps, it is ascertained whether or not the stone is held securely, and in the proper direction; if not all right, it may then be turned by using the point of the finger and relaxing the grasp. Now the handles of the instrument are depressed, so as to avoid resistance from the bones in the front of the pelvis, and the extraction is commenced, steady and gradual; if difficult, dilation is effected, and the process so facilitated, by moving the forceps gently backwards and forwards; no force or violence is required, either in pulling or dilating; all should proceed smoothly and with deliberation.

The forceps must be proportioned in length to the size of the stone; a large concretion requires long forceps, both that it may be grasped securely, and that sufficient power may be afforded for the extraction.

Some stones are of such a size as will not admit of passage through the section of one side of the gland. By using the blunt-pointed knife, directed by the finger, without any additional external incision, a wound is made on the right side of the prostate, in

the same direction and to the same extent as that on the left. Thus a triangular flap is formed, the apex towards the membranous portion of the urethra, and through the opening thereby afforded any stone which will pass through the bones of the pelvis can be extracted without much difficulty. But no benefit can result from cutting both sides of the prostate, either by the double lithotome or in the manner just detailed, in all cases. It is time enough to incise the opposite side when, by introduction of the finger through the usual wound, it has been ascertained that the stone is too large to pass through. Then it is safer to cut the other side, than to enlarge the original opening, either by the knife, or by laceration in cruel attempts to extract the stone through an insufficient opening.

When the stones are small, the scoop is the preferable instrument. By it the bladder may be soon cleared, even when the concretions are numerous. It is introduced along with the finger, is brought in contact with the foreign body, and passed beyond it or beneath it. Then the point of the finger is placed on the lower part of the stone, so as to steady and secure it, and the scoop and finger retaining this relation are gradually withdrawn along with the stone. More than one, perhaps, may be removed at each withdrawal of the instrument. The flat and slightly bent lever, usually forming the handle of the scoop, is useful should the forceps unfortunately slip during extraction, leaving the calculus impacted in the wound; by insinuating it behind the stone, and em-

ploying it partly as a lever, partly as an extractor, removal is completed.

If the stone break, which should not often happen if the forceps be used properly, the fragments must be carefully brought away, the larger by the forceps, the others by the scoop. The sand and detritus which may remain are washed away by injecting tepid water into the bladder, afterwards promoting copious secretion of urine by diluents.

After almost every operation for stone, particularly when the concretions are numerous, or when they have broken into fragments, a searcher is useful to ascertain whether or not all have been removed. It is a slightly curved sound, with a bulbous point. Having been introduced by the wound, it is passed into every part of the bladder with great care, with the view of detecting small calculi, or fragments, which may have escaped the search of the finger, forceps, and scoop. Besides this precaution, the extracted fragments should be carefully examined, and the stones built up, that the surgeon may better judge if they be all there. The surface of the stone affords considerable information; if it be uniformly rough, the likelihood is that it is solitary; if one or more points are smooth, it is probable that these have been occasioned by the attrition of other calculi. If suspicion still exist of part remaining, examination may be made through the wound, during the suppurative stage, six or eight days after the operation, before it has closed much.

It has been proposed to break the stone when very

large, to facilitate its extraction, and many instruments have been contrived for the purpose. I have had no experience of the proceeding, but consider the following description of instrument as the best adapted for the purpose—strong, massy forceps, of considerable length; the blades proportionally narrower, but much thicker, than those of the extracting forceps, and armed with several strong teeth, thick at their origin, tapering gradually, and terminating in a sharp ridge; the handles also thicker than they are broad, that they may not yield to the compressing force, and approximated by means of a combination of the lever with the screw. The foreign body is secured firmly between the blades closed on it; the handles are then fixed by a screw and nut, and compressing force is exerted by the lever acting both as a lever and a wedge. The screw, turned by the fingers, will suffice to crush many concretions; and none can withstand the full power of the instrument. But it is, perhaps, safer to open the bladder above the pubes, and extract the stone through a wound in that situation, when it is too large to pass betwixt the rami of the ischia.

When the stone or stones have been extracted, and the surgeon has satisfied himself that no more foreign matter remains in the bladder, the next step in the lateral operation is the insertion of a gum-elastic tube, from four to six inches in length, according to the depth of the perineum, in calibre a little larger than a full-sized catheter, provided with a noose attached to each of two rings at its neck, and at its farther

extremity open at both point and sides. It is introduced along the forefinger in the wound, and its extremity lodged fairly within the bladder; a double tape is attached to each of the nooses at its orifice; one is passed up in front, and secured to the fore part of a broad band round the loins; the other is brought under the thighs, and fixed behind. The object of its introduction is to facilitate the escape of urine externally, and prevent infiltration of the cellular tissue by this fluid. The wound, when made according to the directions which have been given, is both conical and dependent—the external opening is free, the internal small, the intermediate space gradually contracting as it approaches the bladder, and the inferior part of the wound of the integument is lower than the corresponding portion of the prostatic section; thus the draining away of the urine is favoured, but it conduces very much to the patient's safety to ensure still farther its free escape by the insertion of a tube—part passes through the tube, and drops from its orifice, part flows by its side according to the laws of capillary attraction. For some hours after the operation, it is necessary to clear out the instrument frequently by means of a feather, otherwise its extremity will soon become obstructed by coagula; in short, this must be persevered in till colourless flow from the orifice shows that the internal oozing of blood has ceased, and that nothing is passing but urine. When by salutary effusion from the vessels the surface of the wound becomes consolidated and imperviable to the urine,

the tube is to be withdrawn, but not till then ; in young persons it may be removed after twenty-four hours, but in those advanced in life and of relaxed habit it must be retained for forty-eight or more.

The tube is also of service should bleeding continue from branches of the superficial pudic, or from small arterial twigs in the neighbourhood of the prostate ; for it admits of the application of efficient pressure to the bleeding point, without interfering with the escape of urine, and so increasing the danger of infiltration. Slips of lint are pushed along it to a sufficient depth, and are retained, if necessary, by compress and bandage, the orifice of the tube being left clear. But, as already stated, it is indeed very seldom that this proceeding will be required, if the operation have been conducted with proper caution.

After the tube has been secured by its tapes, or during this process, the patient is unbound ; he is placed in bed with the thighs separated and bent, and must be kept very quiet. Diluents are administered copiously, to encourage the secretion of urine ; he cannot *wet* too much. His nourishment must be very sparing, consisting chiefly of bland fluids ; and all sources of inquietude and irritation must be carefully avoided. Depletion, whether general or local, will very seldom be required ; danger is not to be apprehended from inflammation so much as from infiltration of the cellular tissue by urine. In the fatal cases, unconnected with hæmorrhage or exhaustion, the peritoneum is not found vascular or coated with lymph, nor is there collection of morbid

secretion from this membrane within the abdominal cavity, but the cellular tissue, along the track of the wound, is black, disorganised, easily lacerable, putrid; or, if the infiltration has not been to such an extent or in such a site as to kill speedily as if by poisoning, unhealthy suppurations are found, extensive, uncircumscribed, composed of sanies, urine, and dead cellular tissue, horribly mixed. Should fixed and increasing pain be complained of in the hypogastrium, the part is to be leeches and fomented; this is the only indication of inflammatory action which has occurred in any of my patients, and it has yielded to the simple treatment here mentioned; so far as I recollect, in only three cases was the leeching necessary. Some patients require support very soon, almost from the first; others evince sufficiency of action throughout, and in them it is very necessary to pay strict attention to the state of the stomach and bowels, lest the action should exceed; some proceed favourably for a time, and then become torpid and stationary, their spirits and constitutional power flagging, in consequence of confinement and the discharge and irritation of the wound,—such also require judicious support, and perhaps slight stimulation.

Union of the wound by the first intention is not desirable; attempts to procure it are dangerous, as conducing to infiltration; the presence of the tube effectually prevents both. Discharge and granulation take place, and the cavity contracts gradually and uniformly. By the sixth or eighth day—sooner

in young people, and later in those far advanced in life—the urine begins to flow in part by the natural passage, causing considerable pain in consequence of the urethra having been for a time unaccustomed to its stimulus; and as the opening in the prostate contracts, the escape of urine by the wound proportionally diminishes. When the natural course is completely restored, the wound closes more rapidly than before, granulations soon fill it up, and cicatrisation takes place. Sometimes, though very rarely, a small fistulous opening remains for some time, through which a few drops of urine may occasionally distil; should it prove obstinate in not closing, it may be touched with a heated wire. And sometimes also, when the urine is unusually slow of coming by the urethra, this may be expedited by the occasional introduction of a catheter or bougie.

It is not often that the operation of lithotomy requires to be repeated. In some few cases, however, the calculous diathesis continues, a new concretion is formed, and the patient again applies for relief, perhaps several years afterwards. In such circumstances, the incisions are to be made in the right side of the perineum; for the track of the former wound is now consolidated, firm, and hard, and would be cut with difficulty. But when, from neglect or want of dexterity, the first operation has been imperfectly performed, one or more stones being left behind, the wound may not heal, nor even contract to any considerable extent; and then dilatation of the existing opening, with fresh section of the prostate,

will probably be sufficient, though at an interval of many months.

It has been proposed to divide the operation into two parts, with an interval of several days between; first to make the incisions, leaving the stone undisturbed, and after suppuration has been fairly established, and the parts become relaxed, then to extract the foreign body, provided it have not in the mean time been discharged spontaneously—in short, to perform the operation *à deux temps*. This method is liable to serious objections. Two operations must in general be more severe than one. The patient is rendered despondent and miserable after the first, by knowing that the object of his suffering has been imperfectly accomplished, or rather not accomplished at all. Much, and often serious irritation is produced by the wounded bladder being contracted on the hard and rough foreign body; patients have sunk under this torture. The cure is tedious. From the earliest times it has been quite well understood, that when the stone cannot be got out it must be left in; but the proposal of always leaving it in, on principle and not from necessity, is really absurd. There is room for suspecting that this mode of operation originated as a virtue from necessity; the extraction of the stone is always the most difficult part of lithotomy, requiring much skill and dexterity, and the operator, finding himself baffled in his attempts to effect it, wisely desists from his futile efforts at the time, and waits for another opportunity. This is certainly better practice than the using of much force, or di-

lating the wound by incision to a dangerous extent, but it is very far from being so good as the immediate removal of the foreign body, smoothly and quickly, skilfully, and without violence ; and it has been already observed, that the cases are very few indeed in which the stone cannot be removed through the prostatic opening without the employment of any force, and without inflicting any injury to the parts through which it passes—without hazard and without delay. The sooner the method *en deux temps* is expunged from the list of surgical operations, the better will it be for suffering humanity and the credit of our art.

In those rare cases in which the stone is so large that it cannot be brought through the outlet of the pelvis, it must either be broken into fragments, or removed entire through incision above the pubes ; as already stated, it is probable that the *high operation* is the safer proceeding. It is, however, an operation attended with much danger. The wound is necessarily extensive, and important parts are liable to be interfered with ; and, from not being dependent, the escape of the urine by it is almost certain to cause infiltration of the cellular tissue surrounding the bladder—an occurrence almost always proving fatal, and that rapidly. The first part of the procedure is to insure distension of the bladder, so that it may rise in the pelvis, and afford sufficient space between its lower part and the anterior reflection of the peritoneum ; but this may prove either very difficult, or altogether impossible, even with the aid of injection by the urethra, in consequence of the unyielding

contracted state of the viscus, and the great thickening of its coats. An incision is made through the integument and fatty matter, from three to four inches in length, in the mesial line, and terminating over the symphysis pubis ; the recti and pyramidal muscles are then separated, the cellular tissue cautiously divided, and the fore and lower part of the distended bladder exposed. The coats are pierced at the most inferior part, and an opening made sufficient for the introduction of the finger. By the finger the dimensions of the stone are ascertained, and then the wound is enlarged upwards to such an extent as will by dilatation admit of the extraction. Forceps are introduced, of sufficient length and grasp, and the foreign body removed without laceration or bruising of the parts. The patient is then laid on his side, a piece of dressing being interposed between the edges of the wound to favour the discharge of the urine externally. The escape of this fluid may be free and copious, and the wound may close favourably ; but the majority of the patients on whom this operation has been performed, have perished either from urinary infiltration, from peritoneal inflammation, or from exhaustion. Fortunately, I have never had occasion to resort to it.

It has been proposed to combine this mode of operation with wound of the posterior part of the urethra from the perineum, in order that a free and depending outlet may be afforded to the urine, and also, that by introducing instruments into the bladder from the lower opening, the organ may be elevated and

stretched so that its fore part may afford sufficient space for the high incision without danger to the peritoneum. With this view the perineum is incised, similarly but to a less extent than in the lateral operation, and the membranous part of the urethra opened. Through this aperture the sound with a stilet for elevating the bladder is passed, and intrusted to an assistant; the incision above the pubes is then made, and the stone extracted, and a tube is left in the perineal wound for discharge of the urine. The plan appears feasible, though complicated, and likely to diminish hazard by preventing infiltration.

The *recto-vesical* method should never be resorted to in preference to the lateral; in other words, it is unwarrantable, in my opinion, in those cases to which the lateral operation is applicable. It consists in exposing the neck of the bladder by division upwards of the sphincter ani and lower part of the rectum, and then either making a section of the prostate in the usual way, or dividing also the coats of the bladder in the posterior fundus, when the concretion is large. The cure is tedious and harassing: the urine and fæces are discharged together, and hardened fæculent matter may accumulate within the bladder; the wound is long in contracting, and often cannot be made to close completely without much trouble, and after a long time; often a fistulous opening remains, communicating with the bladder and rectum, and through this the urine continues to be in part discharged. It has been argued, that the *recto-vesical* method is advisable, with the view of obtaining more

room for extraction of the stone ; but to me it appears that the divided rectum will occupy just as much space in the outlet as when entire and empty. Circumstances may however occur, rendering this operation, or a modification of it, absolutely necessary, as in the following case—the only instance in which I have encountered an encysted stone. The patient, aged 64, of a spare habit of body, was seized with symptoms of stone in the bladder about twenty-four years previously to my seeing him ; at that time he was sounded, but no stone could be discovered. The symptoms gradually subsided, and ultimately disappeared, and he remained for considerably more than twelve years totally free from any affection of the urinary organs. But, about three years previous to the operation, the symptoms returned, and again attentive examination of the bladder was made, without detecting any stone ; on introducing the finger into the rectum, however, as high as possible, a firm substance was felt, globular, of considerable size, and very slightly movable. From this time the symptoms gradually increased in severity, ultimately becoming almost intolerable. At length the presence of a stone was distinctly ascertained by sounding, and the instrument was passed beneath as well as over the calculus ; from simultaneous examination by the rectum, it was evident that the hard bulging body was connected with the foreign matter struck by the sound. The lateral operation was performed, and, expecting to meet with a large stone, both sides of the prostate were divided. The forceps were introduced, but the stone, though easily laid

hold of, could not be moved. Attempts with the instrument were accordingly abandoned, and further examination made by the finger, when it was found that the stone lay fixed in the lower and anterior part of the viscus, that it was firmly enveloped by a cyst situated between the rectum and posterior part of the prostate, and that only a part, small in proportion to its body, projected into the cavity of the bladder. Of this unusual and untoward circumstance, the medical gentlemen present were also satisfied by manual examination. It was quite apparent that it would be impossible to divide the cyst sufficiently without wounding the rectum, and I therefore determined to lay the bowel, the cyst, and the track of the wound into one cavity. This was effected by cutting the upper and anterior part of the cyst, passing a blunt-pointed and curved bistoury behind the remainder of the cyst, insinuating it through the coats of the gut at that part, meeting the point with the forefinger of the left hand passed per anum, and then carrying the instrument forwards to the surface. A strong scoop, much curved, was passed behind the stone, and without much difficulty extraction was thereby completed. Not above a few tablespoonfuls of blood were lost during the operation, in which not much time was occupied, and no bleeding took place after reaction was established. The cure proceeded favourably, though necessarily slow and tedious, the more so since the patient had been very much reduced by the previous suffering. Some superficial sloughing took place in the wound, but the sloughs soon separated, and healthy discharge and granulation fol-

lowed. By keeping the bowels gently open, the annoyance from fæculent evacuation by the wound was in some measure diminished. He was daily out of bed, and took food in good quantity and with relish. At the end of the fifth week, however, he was seized with a severe bowel attack—vomiting, purging, cold extremities, &c.—and the effects of this were never surmounted. The weak state in which it left him continued and increased, he was soon confined entirely to bed, the wound made no progress in closing, sloughing of the back took place, and he sank about the end of the eighth week.

Calculi sometimes lodge in the urethra, obstructing the flow of urine, becoming firmly impacted, and increasing in size. If in the perineal portion of the canal, they are to be fixed and made prominent by being grasped with the fingers, and then exposed by an incision made in the raphe; they are turned out, either with the finger, or by means of a small scoop. If situated in the part covered by the scrotum, the opening should be made, if possible behind, not anterior to it, for a wound in the latter site will be closed with difficulty. When in the posterior part of the canal, they are reached by incision in the left side of the perineum and opening of the membranous portion. After such operations, the wound, if not anterior to the scrotum, usually closes in a few days.

Calculus in the female is exceedingly rare. Concretions are not so apt to be retained in the bladder, as in males; they are passed by the urethra. The

symptoms are similar to those which have been described as indicating stone in the other sex. Sounding is easy ; it is performed with an instrument slightly bent at the farther extremity, and considerably shorter than those employed in the male. Even when the calculi are of considerable size, they can be removed, as well as other foreign matter, by dilatation of the urethra, effected gradually. Portions of gentian root, and sponge tents, were formerly used for this purpose ; but of late years various dilators have been contrived. Some are really new, others have been published as such though correctly represented in works some hundred years old. Their blades are made to separate in a parallel direction by peculiar adaptation of the screw ; and by gradually and very slowly increasing their separation, uniform dilatation is effected. Soon it is sufficient to admit the finger ; then the size of the stone is ascertained, and, if necessary, the dilatation is continued to a sufficient extent. When thus the canal has been widened so as to admit of the passage of the stone, forceps are introduced, and extraction accomplished in a direction downwards, that is towards the vagina. Incontinence of urine is apt to continue for some time after this operation, if the dilatation have been considerable, as well as after the removal of larger stones by incision.

Incision has been proposed in various directions—into the vagina, or by the side of it, upwards and outwards ; and it has also been recommended to cut

the bladder, on the fore and lateral part of its neck, without interfering with the urethra.

By the latter method the chance of incontinence remaining is diminished, but there is a risk of urinary infiltration, and this will require to be provided against by the use of a tube, as after the lateral operation in the male. A staff is introduced, and by it the urethra is depressed towards the vagina. An incision is then made by the side of the crus clitoridis, and through this the finger reaches the neck of the bladder, more by dilatation than by additional use of the knife.

In one case I removed a very large stone by incision. By a straight grooved staff the urethra was depressed; a straight blunt-pointed bistoury being slid along the groove, was carried upwards and outwards, first on the left side, and then on the right—dividing the urethra and parts exterior, so as to form a track of wound, which, after dilatation, would admit of the ready passage of the stone. Extraction was easy. Incontinence continued for many months, but ultimately was in a great measure removed by promoting farther contraction of the opening by the cautery.

Gonorrhœa in females is often confounded with *Leucorrhœa*, which is a very common complaint both in married and unmarried women. *Leucorrhœa* sometimes occurs at a very early period of life, at the age of ten or sooner; and in such circumstances affections of the glandular and osseous systems often supervene. Frequently it precedes the accession of

the coloured menstrual discharge, and in many instances is substituted for it ; it is always most violent after the menstrual period. In leucorrhœa there is generally neither heat nor pain during the passing of urine, and the colour of the discharge differs from that of gonorrhœa, though sometimes very slightly ; the stain of gonorrhœal matter is yellow with a black border ; leucorrhœal is white or yellowish, but does not possess the latter characteristic. The application of leucorrhœal matter will induce discharge from the urethra or from the external parts of some males, but the affection thus caused is perhaps not so violent, nor of so long duration, as that which arises from specific contagion. The effects of leucorrhœa on the system are very troublesome. There is general debility, disorder of the stomach, pains of the back, sides, and limbs, a sallow bloodless complexion, paleness of the lips. It is often a cause, at other times a consequence, of miscarriage. Sometimes it is accompanied with a prolapsus uteri, sometimes with thickening of the os uteri. The discharge which attends ulceration of the parts, from whatever cause, is generally bloody, sometimes it is thick and of a laudable aspect, sometimes thin and fœtid. More or less discharge attends polypus, and is often profuse and coloured.

In gonorrhœa the inflammation is usually limited to the external parts, but sometimes extends along the vagina. In neglected cases great tumefaction of the labia takes place, along with excoriation of the neighbouring parts, patchy ulceration around, and swelling of the absorbents and of the inguinal glands.

Heat, pain, and scalding, are experienced in making water, but in comparison with the other sex females suffer little or nothing in this disease. The parts are much less complicated ; and bad effects seldom follow either the affection or the remedies employed, however strong.

The inflammatory stage must be subdued by anti-phlogistic measures, proportioned to the intensity of the action and the state of the constitution ; they seldom if ever require to be at all severe. Turpentine, and other internal remedies which may prove beneficial in the gonorrhœa of males, are of little use. The external means are to be chiefly trusted to, consisting of astringent and stimulating washes ; when the vagina is affected, the solutions must be thrown up by means of a syringe. In leucorrhœa, the same external treatment is required, and the use of a syringe is always necessary. The washes most commonly employed are—solution of the sulphate of zinc, of alum, and of the nitrate of silver, or a decoction of oak bark or galls. In leucorrhœa the internal exhibition of tinct. lyttæ in large doses may be considered as almost a specific, stimulating the whole system, and correcting that state of morbid debility, both general and local, on which the vitiated secretion depends ; and the injection for the vagina, which is perhaps most efficacious, is the solution of the nitrate of silver. When the menstruation is irregular, blisters and sinapisms may be applied to the loins, with cold bathing, general and local. In gonorrhœa, when only the external parts are inflamed and furnish discharge, the application of

a solution of the sulphate or of the acetate of zinc to the parts by means of lint, effects a cure in a few days — along with strict attention to cleanliness, the observance of rest, regulation of diet, and occasional doses of gentle physic.

Gonorrhœal Lichen not unfrequently follows suppression of the discharge both in males and females. It is preceded by smart fever, headach, and violent pains in the limbs. Inflammation of the fauces is generally present, with superficial ulceration or excoriation; and sometimes the abraded portions of the mucous lining are covered with a whitish exudation. The symptoms subside on the appearance of the eruption, which is papular. It generally appears first on the breast and arms, and then extends over the whole body, accompanied with slight itching. If the case proceeds favourably, the red papulæ disappear in a few days, leaving blains in their stead. Desquamation of the cuticle generally follows. This affection must not be confounded with a cutaneous eruption which sometimes follows the use of copaivi, and which is a species of urticaria.

When the fever is violent, bleeding must be had recourse to, but not to a great extent, and only when it cannot with safety be avoided. Gentle laxatives are to be given. Diaphoretics are very beneficial, and the patient should not be exposed to cold or wet, but kept rather warm, otherwise the eruption may be repelled, the affection thereby prolonged, and the constitutional disturbance augmented. The fauces soon

recover under the use of simple gargles. Mercury is hurtful.

Retention of Urine in females arises from tumours, natural or morbid, of the uterus, or of the vagina and appendages, from displacement of these parts, or from foreign bodies lodged in them. But the consideration of such affections belongs to the accoucheur.

Retention takes place in females from paralysis of the bladder, and the same treatment is necessary as in the case of the male. Hysterical women often take it into their heads that they are unable to empty the bladder, and will not attempt it; and though it may be difficult to convince them of their mistake, yet when they are left to themselves for a little, and begin to feel some of the torments which attend retention, they contrive to get rid of their burden, and that without any very great exertion. Others are still more whimsical, and will push into the viscus needlecases, bodkins, portions of tobacco pipes, and such like. The surgeon should be aware of such whims.

There is, in general, no difficulty in passing the catheter. A short one is preferable, there being less chance of giving pain; and the operation must, of course, be proceeded in with the utmost regard to delicacy: The forefinger is placed in the upper part of the orifice of the vagina, and the point of the instrument, when placed a little above this mark, readily slips into the urethra. It is recommended to use the clitoris as the guide, placing the finger on this,

and moving the point of the instrument thence downwards ; but when this method is pursued, the catheter is apt to enter the more patent passage. The instrument is to be carried gently onwards, in a horizontal direction, till the urine flows. In some cases of enlargement and displacement of the neighbouring parts, the urethra is elongated, and its course irregular ; in such, a long elastic catheter is required. If objections are made to the use of the catheter, at an early period of retention, nitrous ether may be given internally, fomentations applied to the hypogastrium, and a turpentine enema administered. Puncture of the bladder can seldom, if ever, be necessary in the female ; if it should be required, the opening may be made either above the pubes or through the vagina. From the latter method there is a risk of fistula remaining ; but this, as will afterwards be noticed, can in most cases be ultimately made to close. The operation above the pubes has, in some instances, been necessary during parturition, when instruments could not be passed by the urethra, nor through the coats of the vagina and bladder.

False communication betwixt the vagina and bladder, termed *Vesico-vaginal fistula*, is usually the result of mismanagement during parturition. The bladder has been allowed to become over-distended, and in this state to be pressed upon and bruised by the child's head ; or it may have been compressed and bruised by instruments employed in tedious delivery. The consequence is inflammation, violent, and followed by sloughing. On the separation of the

sloughs, the urine escapes, perhaps six or eight days after delivery ; or the anterior surface of the vagina, and the coats of the posterior and lower part of the bladder, have been lacerated by the imprudent use of the crotchet, or some such crooked and awkward tool ; then the escape of urine is immediate. The unnatural flow continues, diminishing after a time, and if the opening be at first not large, and have gradually contracted, ultimately it may escape in but small quantities, at least during the recumbent posture. Of course, the size and site of the opening are very various. I have been consulted in some dreadful cases, incurable and loathsome—the consequence of most culpable neglect and ignorant rudeness on the part of the accoucheur ; the bladder without any part of its posterior fundus, rent so as to admit the fingers ; the rectum also torn extensively—in some, merely a shred of the sphincter remaining ; fæces and urine constantly mixing in one vast offensive cavity. But in general the opening is in the neck of the bladder immediately behind the commencement of the urethra, and nearly in the mesial line ; sometimes it is considerably further back. It can be felt by the finger, and is readily seen by means of a proper speculum, a copper spatula being at the same time used to prevent the folds of the vagina from interrupting the view ; the speculum opened by handles attached to the blades, and prevented from shutting by a serrated semicircular plate interposed, is the most convenient and suitable.

Attempts have been made to close the aperture,

by paring the edges, and then inserting sutures ; but this is a proceeding both difficult in execution and not likely to prove successful ; the thinness of the parts, the presence of a secreting surface on each side, and the oozing of acrid urine betwixt the edges, all militate strongly against adhesion. No benefit can be expected from any treatment, unless the opening be of no great size, and in such cases the cautery will be found most effectual. The speculum is introduced into the vagina, so as to expose the aperture, and guard the neighbouring parts from the cautery ; and should the opening not appear distinct, a flexible wire is passed by the urethra, and insinuated through it. A small heated cautery is then slid cautiously along the speculum, and applied lightly to the margins, with the view of producing a superficial slough ; this separates, and during the consequent cicatrization the opening contracts. When the edges have again become smooth, the cautery is applied as before, and by several repetitions complete closure may ultimately be obtained. The interval between the applications is necessarily considerable ; each must be allowed to have its full effect. Once I attempted to combine the cautery with the suture ; first applying the heated wire, and after separation of the slough, and when the margins were tumified, excited, and apparently prone to adhere by the formation of new matter, then approximating them by a species of twisted suture. At first, matters proceeded favourably, but the ultimate result was not very successful—it was such, however, as to render the plan

worthy of being again tried; if fortunate, it would very much abridge the cure. By the cautery I have succeeded in relieving many, and in curing a few perfectly. I cannot quit the subject, without expressing regret at the frequent occurrence of such cases. I have had three or four in the hospital at one time. The professors of the obstetric art should look to this.

Imperfections of the female genital organs are sometimes met with. The external parts may be well formed, while the vagina is short, and the uterus and its appendages are wanting; or these may be perfect, and the vagina closed at its external orifice, either by a thin and dense membrane, or by a thick and fleshy substance. Young children are not unfrequently presented with the latter kind of imperfection, but in them there is no need for interference; the urine is not obstructed, and it is only towards puberty that a necessity arises for removal of the deficiency. At this period, the menstrual discharges are retained, if the vagina continue closed, and accumulate in great quantity, producing much distension of the canal, pain in the hypogastrium, general uneasiness in the parts, and sometimes swelling of them to a great extent. On division of the membrane, there is an escape of many pounds of dark, thick, putrid fluid, and all the symptoms quickly subside. A cautious incision is made in the mesial line, until the obstruction be completely divided; if an opening be found, a probe, or director, is introduced, and by this the knife is guided. There is

seldom any risk of the parts again coalescing ; when the obstruction, however, is unusually thick, the insertion of dressing between the edges during granulation may be necessary to prevent contraction.

Unnatural adhesions of the external labia occasionally take place, occurring in early life from the healing of excoriation and ulceration caused by neglect of cleanliness. Perhaps the closure is not to such an extent as to prevent escape of the discharges, but still it is inconvenient and requires attention. The parts must be divided in the proper direction and to the necessary extent, and by the interposition of dressing reclosure is prevented.

Contraction of the vagina at a distance from the orifice sometimes occurs. On one occasion I was requested by an accoucheur to examine and divide a very tight, firm stricture, scarcely admitting the finger. Labour had commenced, and the expulsion of the foetus was prevented by the stricture ; it was attributed to injury inflicted in a former delivery. By a probe-pointed bistoury guided on the finger, it was notched pretty deeply at many points—a proceeding which I have followed with advantage in simple stricture of the rectum. Every thing proceeded happily.

Occasionally the contraction of the vagina is to a great extent ; the uterine discharges are not permitted to exist at all, and great uneasiness is thereby occasioned. In one case in which the canal may be said to have been wholly obliterated, from what cause or at what period it did not distinctly appear, I

ascertained the position of the uterus by the finger passed into the bowel, pushed a curved trocar on to it through a considerable thickness of parts, and afterwards dilated this artificial passage by bougies gradually increased in size. The vagina was thus re-established, and menstruation again occurred and without interruption.

Violent and deep *inflammation* of the external parts of generation is not uncommon,—the result of bruise or wound. It is generally met with in the lower prostitutes. The inflammation often attacks the vagina and neighbouring parts, followed by great swelling, and, if not allayed, extensive abscess forms, with much fever and pain; pointing takes place betwixt the external and internal labia. The parts must be copiously leeches, and afterwards fomented; strict rest and antiphlogistic regimen must be observed, and, when matter has formed, a free opening should be made early, to prevent deep and extensive mischief. A sinus sometimes, though rarely, results; generally the cavity fills up, and the discharge ceases in a very few days. These parts are much more vascular than the lower part of the bowel, and when in a diseased condition do not require to be so frequently put in action; hence extensive incision and division of the sphincter is here unnecessary.

Tumours of various kinds are met with about the external female organs; more rarely, internally. Encysted tumours of the labia are not uncommon, and

sometimes solid swellings, varying in size and structure, grow from these parts. I had occasion to remove one of the latter description, which weighed many pounds, and had been productive of great and long inconvenience. The general rules for the extirpation of tumours apply to them. Considerable hæmorrhage may be expected. The operation must be done so as to deform and impair the functions of the parts as little as possible.

New and unnatural growths, or enlargements of the natural parts, as of the prepuce of the clitoris, or of the internal labia, sometimes occur, and may require curtailment.

The external parts of elderly females may be the seat of warty excrescences, degenerating into malignant ulcer, and demanding free removal by incision.

Tumours of a medullary nature sometimes proceed from the interior of the pelvis, and displace and interfere with the functions of the vagina, bladder, and the neighbouring parts; such cases are of course hopeless, and the treatment must be merely palliative.

Polypous tumours, of various size, structure, and consistence, sometimes grow from the cavity of the uterus, or from its orifice, or from the parietes of the vagina. They are generally attached by a narrow pedicle, except when of a truly malignant nature—occasioning discharge, mucous and vitiated, sometimes bloody, often profuse. Bearing down pains are complained of, and the health declines in conse-

quence of the discharge. Most of such tumours are benign, troublesome only from their bulk and situation, and from the irritation which they produce in the surrounding membrane. Removal by ligature is generally the most advisable method of extirpation. The site and nature of the attachment is ascertained, and a fine and strong silver wire, or a piece of catgut, is noosed round the base by the finger, and gushed down close to the origin, care being taken not to include the healthy parts beyond the growth. The ligature is tightened by passing it through a canula, or along a strong probe, with a ring at each extremity, to the lower of which it is secured. It is drawn more tightly from time to time, till the tumour drop away. By practice only, can dexterity in such manipulation be acquired; the object being understood, it must be attained by perseverance.

Malignant disease of the uterus is common. Various morbid alterations are here met with; soft, or hard, or bloody masses, earthy deposits, &c. The disease generally commences in the neck, with fullness and thickening; in many females it is attributable to faulty menstruation, to leucorrhœa, or to other irritations in the neighbourhood. Ulceration sometimes occurs, not of a malignant nature, from similar causes; but in old females this is either of a bad kind from the first, or degenerates, presenting all the usual characters of malignant sore on a mucous surface. The surrounding induration is usually great, and quickly spreads to the neck and body

of the organ, contaminating also the neighbouring tissues and the lymphatics.

Some bloodthirsty accoucheurs and operators have attacked the uterus unrelentingly ; more than one appear to have been seized with the monomania of cutting out part or the whole of the organ. Numerous females, at a period of life when malignant diseases rarely show themselves, have been subjected to excision of the os and cervix uteri. Some forty or fifty were operated on within a very few months ; in almost all of these cases the proceeding was, without a doubt, cruel, reckless, and unnecessary. Attention to the general health, with local applications, would in all probability have restored the parts to a healthy condition.

Malignant disease affecting the uterus may be removed, at an early stage, by incision, with propriety and safety : I have done so successfully. The part is examined by means of a hollow tube of tin, polished inside, gently and cautiously introduced. A dilator as well as a speculum is required in the operative proceedings for removal of the parts ; and for this purpose the instrument mentioned, when treating of vesico-vaginal fistula, is to be employed. When this has been introduced, the os uteri is laid hold of by one or more vulsella, and pulled down ; the diseased portion is then removed by a blunt-pointed knife, the incisions being carried beyond the hard and altered part. There is not much loss of blood, and it is easily arrested by stuffing the vagina. Afterwards bland fluids are injected, and, after a time, gently

stimulating, to wash away the superfluous discharge, and promote healing. The state of the sore can be occasionally examined by means of the speculum, and nitrate of silver or other applications employed when necessary.

When the disease is in an advanced stage, the neck of the uterus is involved completely, and there is an uncertainty as to how far the morbid alteration extends. Only palliative treatment can be adopted,—soothing applications, and internal remedies according to the symptoms. The practice of some, however, is more bold and decisive. The uterus has been cut out by incision of the abdominal parietes. It has also been removed through the outlet of the pelvis. As was to be expected, the patients have perished from loss of blood, and the shock of such barbarous proceedings; one or two perhaps survived, only to die from extension of the disease to the internal parts, within a very few months. Such doings are not justifiable by any plea, and if repeated, should be punished, not merely by the desecration of all professional men of sound sense and principle, but by the strong arm of the criminal law of the land.

The *Common Iliac* artery may require ligature, on account of extensive aneurism, involving the internal iliac, or its branches at their origin, or encroaching on the external iliac to near the bifurcation. It may also be necessary, in consequence of wound of the artery, or in cases of secondary hæ-

morrhage from branches of either the external or the internal iliac.

An incision is made through the abdominal parietes, commenced over the passage of the chord through the transverse fascia, and extending upwards, and a little outwards, for five or six inches; its extent depending on the size of the patient, the thickness of the parts to be divided, and the consequent depth of the vessel. By this first incision, the skin and superficial fascia of the abdomen are divided, and then the muscles are penetrated, the line of the preliminary wound admitting of their being cut in the direction of the fibres. After the external oblique has been passed, the proceedings require to be conducted with great caution. The fibres are cut by the hand unsupported, and then the transverse fascia is scratched through, slightly and with great precaution, cutting upon the finger or a director introduced at the lower angle of the wound. By means of the finger, the opening is dilated, and the fascia separated from the peritoneum. This membrane and the parts within it are then, with the utmost gentleness, pushed inwards and upwards, by the hands of an assistant, so as to expose the bottom of the wound. The course of the vessel is now felt for, and by separating the edges of the wound, either by the fingers, or by broad and thin copper spatulæ, its bifurcation may be seen. About an inch, or less, above this point, the artery is slightly detached from its connexions by the point of the knife, separating it from the vein on its posterior and inner surface, and a blunt point-

ed needle, armed with a firm ligature, is pushed beneath, without force, and close to the coats of the vessel. The deligation is made firmly, and both ends of the ligature are brought out at the wound; this is then approximated by a sufficient number of stitches, and a compress and bandage applied.

This operation is not often required. I had recourse to it once in bleeding after very high amputation of the thigh, occurring some days after the operation. The hæmorrhage was effectually arrested, but the patient did not recover from the effects of the previous loss of blood, and continued to sink.

Aneurism of the branches of the *internal iliac*, whether spontaneous or the result of wound, is rare. When it does exist, its signs are sufficiently distinct. The old operation—opening the tumour by direct incision, and tying the vessel close to the cyst—has been performed successfully in one remarkable case on record. But this is attended with much risk, there being no means of commanding the bleeding during the incisions, nor until the ligature is placed and secured. The preferable proceeding is to tie the internal iliac, near its origin, as has been put in practice successfully in a few cases. The same incisions are made as for reaching the common iliac, and then the sacro-iliac junction is felt for; with the nail of the forefinger the cellular tissue is cautiously and gently separated, and a needle and ligature placed under the vessel. In a corpulent adult, the needle, with a movable point, will be useful, as also the

copper spatulæ, to keep the parts aside ; and a serrenœud may assist in the securing of the noose.

Aneurism in the *Groin* is not uncommon, and is very easily recognised. The old operation has been attempted, and unsuccessfully. Ligature has been placed on the distal side of the tumour, with no favourable result. One horrid example of the latter operation is on record, in which the femoral artery had been completely obliterated spontaneously, and nerves, vein, and portions of the muscles, were all included in ligature, by one random thrust of a sharp needle. The *external iliac* is to be tied—a proceeding now regarded as one of the regular operations of surgery, and likely to ensure a favourable result. It was first undertaken in a case of secondary bleeding after ligature of the femoral, and since, has often been performed for the cure of inguinal aneurism, with almost uniform success. The incisions are made in the same direction as recommended for ligature of the common and internal illiacs, but not nearly so extensive. This is preferable to incision, either in the direction of the vessel, or of a semilunar form with one of the corners pointing upwards ; the abdominal muscles are less weakened, less injury being inflicted to the muscles, and no troublesome bloodvessels are encountered. The artery is well circumstanced for the application of ligature, affording a considerable extent without the giving off of any branches. It is easily exposed by cautious separation of the cellular tissue, and the ligature is secured either towards

its middle, or at its upper part, according to the size and situation of the aneurism.

Popliteal aneurism is of more frequent occurrence than any of the preceding, and in regard to it also the old operation has deservedly fallen into disuse. It seems in most cases to be occasioned by partial laceration of the coats of the vessel; a sudden pain, and a feeling as of the receipt of an injury on the part, are felt, during some violent or unusual exertion; the pain continues, and an unwonted beating is soon perceived in the ham, along with inconsiderable swelling; the tumour with pulsation increases, and may ultimately attain a large size, causing pain, general uneasiness in the limb, and lameness, sometimes œdema. In cases of long duration, and when the patient is cachectic, the bones become diseased, absorption being caused by the pressure of the tumour, and deep and extensive abscess may form in the soft parts.

The *superficial femoral* is to be tied, and the preferable point is where it is crossed by the sartorius muscle. This is a better practice than removal of the limb, which has not unfrequently been resorted to in cases of large aneurism; there is great risk in such a proceeding, the anastomosing vessels in the thigh are all much enlarged, profuse hæmorrhage takes place during the incisions, not completely arrested by any pressure, and probably twenty arteries or more require ligature, as I have witnessed; after all, the occurrence of secondary bleeding is not unlikely. I have tied the femoral artery, with a favourable re-

sult, in some cases of very large aneurismal tumour, and in one instance after the cyst had been imprudently punctured. An incision is made from three to four inches in length, and in an oblique direction in regard to the thigh, tracing the inner border of the sartorius muscle, and so placed that its middle may correspond with that part of the artery on which the ligature is to be put. In order to insure the wound being thus situated, there is no need for measurements; these are but a clumsy substitute for anatomical knowledge. The surgeon, well acquainted with the relative situation of the parts, finds it sufficient to ascertain the exact course of the muscle by manipulation, whilst the thigh is slightly bent, and then guides his knife by the eye, unfettered with mathematical diagrams. The muscle is exposed almost by the first incision; the dissection is then continued through the cellular tissue on its inner border, until the sheath of the bloodvessels is reached, the branches of the crural nerve on the fore part being carefully placed aside uninjured; the sheath is cautiously opened immediately above where the muscle conceals it, and the artery separated from its connexions to a very slight extent; the needle is then passed, and the ligature applied. The operation, when thus conducted, is exceedingly simple. But embarrassment and delay have often been experienced from following an opposite method, cutting down on the outside of the sartorius; the muscle must either be dissected from its attachments and turned over, or cut

across ; or the artery cannot be found, and an additional external wound is necessary.

The artery may require ligature at a higher point, either in consequence of wound, or for the cure of *femoral* aneurism. This disease, however, is very unfrequent. When it does exist, it is usually so situated as not to admit of the favourable application of a ligature below the origin of the profunda ; and it is necessary to tie the *common femoral*. The course of this artery being superficial, is easily ascertained ; an incision of convenient extent is made in the same line, penetrating the skin and fatty matter ; the cellular tissue is carefully separated, and the sheath exposed ; a limited opening is made, with corresponding detachment of the vessel, and the ligature applied, close to the lower edge of the ligament of Poupert. But ligature of the external iliac, is in most cases to be preferred. This has proved successful in more than one case of double aneurism, one in the groin, the other in the ham.

In ligature of the common and of the superficial femoral, the vein is in more danger than the nerve, and the utmost caution is required lest it be punctured. It has been wounded—I witnessed one instance of it ; the opening was drawn together and closed by ligature, inflammation of the vein supervened and proved fatal.

When secondary bleeding occurs, on the separation of the ligature, either after this operation or

after that for popliteal aneurism, compression is not to be trusted to, nor should the vessel be tied higher in the thigh. From imprudent reliance on the former method I have known patients perish. An incision must be made in the same line as the former, and a ligature placed on the vessel both above and below the bleeding point.

The arteries of the leg very seldom require ligature, except for wound. In such cases, the source of the bleeding must be the guide to the incisions, and these should be placed so as to interfere with the muscles as little as possible, always cutting in the direction of the muscular fibres. When the bleeding point is arrived at, the vessel is exposed to a short distance, and tied above and below the wound. During the dissection, it will in most cases be necessary to arrest the bleeding by pressure in the ham, either by the fingers of an assistant, or by means of a tourniquet.

The thigh may be the seat of *aneurismal varix*, the result of wound, as in the following case. Fourteen years ago, a young man wounded the lower part of his thigh deeply by the accidental thrust of a narrow chisel. The puncture was in the direction of the femoral artery; violent hæmorrhage was the immediate consequence, and after he had fainted the wound was stuffed and compression applied. In eight days the parts had healed, and he returned to work as usual. But about twelve months afterwards, trou-

blesome pulsation was perceived in the part, at the same time the veins of the leg became varicose, and a succession of ulcers formed on the lower and anterior portion of the limb. The affection attracted but little of his notice till about six months since, when he observed a considerable swelling in the site of the wound, beating strongly, and the pulsations accompanied with a peculiar thrilling sound and feel—not confined to the tumour, though strongest there, but extending to the groin along the course of the femoral vein, which was evidently much dilated throughout its whole course. At present the tumour is nearly equal to the fist in size, of regular surface and globular form, pulsating very strongly, and imparting to the hand the peculiar sensation of aneurismal varix, remarkably distinct and powerful. The pulsation and thrilling are continued, in a less degree, to Poupart's ligament, and down to the calf of the leg. On applying the ear close to the tumour, or listening through the stethoscope, the peculiar noise is not only felt, but heard of almost startling intensity—somewhat resembling the noise of complicated and powerful machinery, softened and confused by distance. By making firm pressure on the tumour, the thrill is lost, and the regular pulsation alone perceived; at the same time, the turgescence of the femoral vein disappears, and on compressing the femoral artery in the middle of the thigh, both pulsation and thrilling are arrested, and the swelling much diminished,—but only temporarily, for the collateral circulation is free and complete. He feels

little pain, but exercise and exertion of every kind are seriously impeded ; constant and firm pressure on the swelling, with uniform compression of the whole limb, has been employed, with the effect of relieving all the symptoms, and rendering the limb much more useful, and by its continuance it is to be hoped that the disease will at least be considerably palliated.

In the lower extremity, as in the upper, the *bursæ* become enlarged, in consequence either of pressure or of external injury. The affection may be acute, following a blow or squeeze, but is most frequently chronic, enlarging gradually and with little or no pain, and caused by habitual pressure on the part. From this, it will at once be understood, why the bursa over the patella should be the one most commonly affected. Its vulgar name, housemaid's knee, marks its cause—the avocations of such persons requiring them to rest on one or both knees, frequently, and often for a long time. It also occurs in shopkeepers, and other persons accustomed to shut drawers with their knee, or in other ways to make frequent pressure on that part,—in gardeners, and those employed in similar pursuits. In the acute swelling from injury, local depletion, fomentation, and rest are required, and these are generally sufficient to arrest the swelling, and promote its subsidence ; but, in some cases, the fluid deteriorates and the surface inflames, and free incision is required, followed by poultice, and afterwards by simple dressing. In the chronic collection of clear fluid, gentle and continued stimulation of the surface, as by the gum and mercu-

rial plaster, causes gradual decrease by absorption ; the causes of the affection being at the same time studiously avoided.

Unyielding parts, habituated to pressure, defend themselves by the interposition betwixt them and the surface of a movable bag containing fluid ; the cellular tissue condenses into a cyst, its internal surface assuming a serous appearance, and secreting a fluid resembling the synovial. Such adventitious bursæ are not unfrequent on the ancles and feet, as in tailors, or others usually sitting cross-legged. They may attain a considerable size, and so produce deformity ; but they should not be interfered with unless they become inconvenient, as from excited action.

When the extremity of the metatarsal bone of the great toe is large, and consequently the seat of pressure, a bursal formation is produced in the soft parts covering it ; this from increase of pressure, or other irritation, may inflame—forming the painful and troublesome disease termed *Bunion*. Sometimes unhealthy abscess occurs, with thickening, infiltration, and condensation of the surrounding cellular tissue ; in such cases, incision and poultice are required, and occasionally it is necessary to destroy the unsound cellular tissue and the degenerated cyst by free application of the caustic potass. The cyst is thus got rid of, healthy granulation takes place, and by afterwards avoiding undue pressure upon the part, a permanent cure is obtained.

It has been elsewhere mentioned, that *cartilaginous bodies* sometimes form within articulating cavities,

occasionally attached by a narrow and slender connexion with the secreting surface, but generally loose, seldom numerous, and usually of no great size. They are most commonly met with in the knee-joint, producing inconvenience by impeding progression. Sometimes they are neither painful nor annoying, being small, and seldom becoming interposed between the articulating extremities of the bones during motion; such ought not to be interfered with. But when large, they may be so troublesome as to warrant incision and removal. The foreign body is made to project on one side, and, having been made as superficial as possible at a favourable point, is fixed by the fingers of an assistant. The integuments are then drawn to one side, and an incision made over the body, the capsule is cut to as limited an extent as possible, and removal effected by pressure—or it may be laid hold of by a hook, and extracted; if the cartilaginous substance be attached by a pedicle, this must be divided, but with great gentleness and caution. The integuments are immediately allowed to resume their natural situation, and so to close the wound of the capsule by overlapping it; the skin is then accurately approximated by the adhesive plasters. The limb is kept extended, and not the slightest motion of the joint permitted. The patient is confined constantly to the recumbent posture, purged, and kept on low diet; the utmost vigilance is necessary to prevent inflammation of the synovial apparatus. In some patients on whom I have performed this operation, the wound closed by the first intention, and no untoward symptom threatened, mo-

tion and the erect position being resumed in a few days. But in the last case, though the extirpation was performed with the utmost care, most violent inflammation supervened; the wound opened, synovial secretion flowed out in large quantity, profuse escape of unhealthy matter followed, and exhausting discharge continued for many weeks. At one time the constitutional disturbance was so great as to endanger life; the limb was saved with difficulty, the joint ankylosed. From the result of this case, I am disposed to dissuade operative interference, unless the patient strenuously urge it, and be willing to take the responsibility for the consequences on himself.

Congenital *distortion* of the feet appears in many cases to be hereditary; and often several in one family are born with similar deformities. The foot is turned either outwards or inwards, usually inwards. The bones of the tarsus may be deficient, or imperfectly formed, but generally are natural in their formation, unnatural merely in their relation to each other and to the ankle-joint, the muscles and tendons being also perfect. In such the deformity can be remedied, during childhood, by mechanical means—apparatus being worn, contrived so as gradually to bring the parts into a proper relation to each other. In advanced life the deformity is irremediable; but frequently nature in part removes the impediment to progression, by the formation of adventitious bursæ on those parts of the sides of the feet which bear pressure during the erect posture.

The phalanges of the toes in general resemble those of the fingers in their diseased actions. *Exostosis* of the extremity of the *distal phalanx*, however, has no analogy in the upper extremity; it is by no means an uncommon affection, and usually occurs in the great toe. The growth is generally globular and rough in its extremity, narrow at its origin, attached on the dorsal aspect, projecting obliquely upwards, and always of similar structure with the phalanx. Sometimes they are met with of a size nearly equal to that of the bone from which they spring, but the majority are considerably smaller. At first the patient complains merely of pain in the part while walking; soon the pain increases so as to impede progression very seriously; then the nail is found to be raised at its margin, and to cover a hard, unyielding, and tender swelling. The elevation of the nail increases, and the tumour becomes more apparent, covered by hardened cuticle, causing great uneasiness, and almost entirely preventing walking exercise.

It has been recommended to expose the tumour by incision, and remove it at its origin. This affords temporary relief, but the disease is in no long time reproduced, and the incision must either be repeated, or the phalanx amputated. The preferable practice, according to my experience, is to remove the phalanx at once. It is less tedious and painful than the incision, produces very little, if any, impediment to progression, and of course is quite effectual in eradicating this most annoying though apparently simple disease.

Of Fractures. — Deformity, shortening, loss of power, unnatural motion on extending and moving the part, pain, and grating, mark solution of continuity in bone, or *fracture*. Swelling, with spasmodic action of the muscles, soon takes place. One or several of these symptoms may be wanting; there is little deformity, and no shortening, when one of two or more parallel bones is fractured. In fracture of the extremities, extrication of air into the cellular tissue, about the ends of the bone, is not unfrequent, though difficult to account for—giving rise to crepitation, superficial, and quite a distinct sensation from that imparted by the broken bone.

Bones become brittle as age increases, and fragility is also induced by certain disordered and debilitated states of the constitution. In some patients, the bones give way on very slight force being applied, after what may have been supposed a rheumatic attack; the thigh is broken by turning in bed, or by walking from the bed to a chair. In one instance, I had put up a fracture of the thigh with a long splint, and in three weeks afterwards the humerus was broken over the end of the splint during an attempt by the patient at change of posture. In such cases union either does not take place, or is very imperfect.

In children the bones frequently contain little earthy matter, bend easily, and often break partially on the convexity of the curve. Even at the age of twelve or thirteen, bending of the bones from injury sometimes occurs to a great extent, as of the forearm from a fall on the palm of the hand; in adjusting the parts, a slight crackling is heard when they are

brought nearly straight. Complete solution of continuity, though more rare, is occasionally met with in very young subjects.

Fractures are generally the result of great force applied directly to the shaft of a bone, or to its extremity; but they are also not unfrequently caused by twisting of a limb whilst the muscles are in powerful action. Bones are broken transversely; but more frequently there is a degree of obliquity in the fracture, and fragments are generally detached. A bone may be split longitudinally, as from a musket-ball striking its shaft in the centre; and fissures often extend from a cross break to a considerable extent, sometimes into joints.

Swelling is often rapid, from extravasation of blood; at other times it is slow, and of a serous character. At first it is soft and yielding, but after a time painful inflammatory tumescence supervenes, the violence and extent of which will depend on the severity of the injury, and very much also on the treatment to which the parts are subjected. If the bones be put as nearly as possible into their original position, and retained so, judiciously—the limb being laid in a comfortable and unconstrained posture, and the bandages, splints, &c., properly adapted—little or no pain or inflammatory swelling will occur; no more action ensues than is required for reparation of the injury. If, on the contrary, the bones are allowed to remain unreduced—perhaps after being well handled—their broken ends, lying among the soft parts, are pulled about by violent spasms, laceration of the muscles and vessels is increased, effusion, swelling,

and violent inflammatory action occur, the pain becomes excruciating, fever and delirium follow ; there is an imminent risk of gangrene, and extensive supuration among the muscles is almost inevitable. If the patient recover, the union is bad, and the limb deformed.

A fracture is said to be *simple*, when there is no wound of the superimposed integuments. The external parts may be bruised, or the deep structure much injured, with laceration of the vessels and rapid and great swelling ; or there may be little or no injury of the soft parts. Great danger may exist without division of the integuments ; these, yielding under the force, may remain entire, whilst by great and direct violence the bone is comminuted, the muscles broken up, vessels and nerves torn,—the limb is infiltrated with blood, and must become gangrenous as soon as reaction takes place. But usually these untoward circumstances do not exist in simple fracture, the soft parts being but slightly injured.

Fracture is *compound* when the integuments are divided by the external force, so as to expose the broken bone. But the wound may not penetrate to the bone ; and then the accident is termed fracture with wound, not compound fracture. The soft parts are often divided by the sharp end of the bone ; this is frequently the case in oblique fracture, occasioned by a fall from a height, the lower fractured extremity being pushed forcibly upwards. The muscles are usually much injured. The wound is either large or small, lacerated or clean.

Fracture, simple or compound, is *comminuted* when

the bone is divided at the broken point into fragments, either small and loose, or large and adherent to the covering of the bone and other soft parts.

Fracture may be *complicated* with wound or displacement of a neighbouring joint, and with laceration of large bloodvessels and nerves.

Union of divided bones, as of soft parts, is preceded by incited circulation in the part, and effusion of organisable matter. The extent of action is regulated by that of the injury, whether inflicted by accident or by operation. If the soft parts have not been much bruised, if the bone and its covering are merely separated and slightly displaced, and then speedily put in contact, the incited action and the effusion are limited to the divided parts. There is no irregularity afterwards at the point of fracture, the new matter that is not required being absorbed soon after deposition; the bone is smooth and even as before. If, on the contrary, there is much displacement, and if that is not entirely removed, intense action ensues both in the soft and hard parts, there is great effusion of new matter, or *callus*, soft and yielding at first, but gradually becoming hard and dense—bony particles being deposited from the vessels ramifying in the extremities, or in the attached fragments, of the old bone. When detached portions of callus are found lying in the soft parts, a piece of old bone which retained its vitality has formed the matrix of the deposit; the osseous substance has not been secreted from the arteries of muscles, cellular tissue, or membrane.

In badly reduced fracture the swelling is great and

hard. The callus is *exuberant*, much being required for the union of the fractured ends that overlap, and are perhaps far from being in contact ; the vascular action and accompanying effusion are great, according to the necessity for them. The bone at the united part is enlarged to double its original thickness, or even to a greater size. After some time, the ends of the old bone, and part of the new deposit, are rounded off by absorption of the protuberances, and the part becomes more shapely.

When the ends of the bone are not well placed, or when they are moved occasionally whilst the uniting medium is still soft, there is danger of a false joint being formed—the callus either giving way, or being all along imperfect, and the extremities at the soft part becoming smooth and movable on each other ; or incited action may run high and terminate in suppuration, with death or ulceration of portions of the bone.

Fragments are sometimes entirely detached at the time of the accident, and perish at once ; or are so slightly connected with the shaft that they lose their vitality on the first accession of inflammation, become surrounded by purulent matter, part from their slight attachments, and come towards the surface. Or the shaft itself may be so bruised by the violence of the injury as to be incapable of resisting incited action, though slight. By malpractice, such untoward consequences as the preceding, and many others beside, are frequently induced.

The uniting medium of separated bones remains soft for some time, as was already observed ; and

often, whether from the state of the constitution, or the circumstances connected with the fracture, the parts remain long movable. Pregnancy is said to prevent union ; but I have often seen fractures in pregnant women unite as speedily and firmly as if the patients had not been in that state, and otherwise in robust health ; profuse uterine or vaginal discharges, or determination to particular parts or organs, will certainly retard union.

In ordinary cases, the limb, if not lying altogether straight, can be moulded into a proper form after the lapse of eight or ten days from the time of injury, without the patient suffering any great degree of pain, without the process of union being at all interrupted, or the cure protracted ; even at the late period of five or six weeks, badly united fractures may sometimes be much improved by gradual pressure and change of position. A gentleman fell from his horse, and sustained simple fracture of both bones of the leg, near the middle. It had been laid and retained on its side. I saw him exactly six weeks after the injury ; the leg was much curved forwards, and the foot turned outwards. The limb was placed on the heel, and a long splint, with a foot-piece, applied on the outside ; by attention to its position, and by gradually tightening the bandages, it soon became quite handsome. Care should be taken not to allow the patient to rest too soon on the fractured limb ; for though quite straight, symmetrical, and of the proper length, when the retentive apparatus are discontinued, it may become short and deformed in a few days from even slight weight being put upon it.

The period at which firm union takes place varies ; the process is more rapid in young people than in those advanced in life, and will depend more on the extent of the injury, and its vicinity to the centre of the circulation, than on the size of the broken bone. The requisite length of confinement is regulated by these circumstances, and by the use to which the part is to be afterwards put ; the lower limbs require longer time than the upper.

In the treatment of fracture, as in solution of continuity in the soft parts, great advantage is gained by placing the disjoined parts as nearly in their original position as possible, retaining them so, and allowing of no motion. These indications ought to be accomplished very soon after the accident ; many evils are thus prevented—the further laceration of the soft parts, the inflammatory effusion into all the tissues, and the consequent startings and spasms of the muscles. This cannot be too much insisted on. There is much folly and absurdity in allowing a broken limb to lie unrestrained—leaving the ends of the bones displaced, the one riding over the other—making attempts to keep down the inflammation, applying leeches and large poultices—all ineffectual so long as the palpable cause of incited action remains unheeded. The circumstances which kindle and keep up inflammation should always be understood when so easily discovered as in fracture, and when understood should never be lost sight of. If the parts be replaced there will seldom be inflammation ; if they remain displaced, the inflammation is so great that it is impossible to subdue it by any means short of re-

moval of the cause. There is also an impossibility,—not to mention the patient's sufferings,—of reducing bones to a good position some weeks after the accident. Such practice has been extensively followed and recommended by some writers, even modern; they set about reducing a fracture at a period after the accident, when, by proper treatment, union would have been completed, or at least far advanced. The confinement and suffering of the patient are increased threefold, and after all it is a bad cure, and there is a risk of false joint.

In all fractures, whether simple or compound, comminuted or complicated, if an attempt is to be made to save the limb, let reduction be immediate; coaptation and retention of the separated parts cannot be made too soon. A neglected case may be met with, in which the intensity of inflammatory action in all the tissues may forbid immediate interference. But even though inflammatory action has taken place to some extent, there are no surer means of arresting it than removal of its cause—the irregular ends of the bones being taken away from among the soft parts—provided it can be done without violence or increase of tension. Reduction is facilitated by proper position of the limb, by relaxation of certain sets of muscles. Extension and counter-extension are made, but very little force required; the surgeon extends the limb with one hand, and resists with the other; when the system is excited, and the muscles act spasmodically, an assistant is required to steady the limb, and to resist the extending power which the surgeon employs. Then the position of

the limb and of the patient, when long confinement is required, must be considered, and rendered as easy as possible, though at the same time secure. The apparatus for retaining the bones in the right position must be varied according to circumstances.

In compound fractures, when the wound is so small and clean that adhesion readily takes place, the cure is as rapid as in the simplest form of accident; but when the soft parts are much lacerated, the breach in them must be repaired by granulation; there will be profuse discharge from the wound, with risk of deep suppuration, and union of the bones will be slow. To accomplish reduction, long and sharp pieces of bone may require to be removed by means either of the saw or of the forceps, or else the wound must be dilated; both proceedings may be necessary in some cases. Detached portions of bone, and foreign bodies, if any, must be taken away; and the edge of the wound may be approximated when a reasonable chance of adhesion exists. The limb must then be properly placed and secured. Inflammatory action, should it threaten, must be kept down, but bleeding and purging are to be employed with caution. The action and its consequences are moderated by one or two depletions, but these must not be had recourse to without due consideration of circumstances; strength is required to effect the action necessary for union, and to withstand the subsequent suppurations, though these may be prevented or at least moderated by timely depletion. Abscesses are to be opened early, the parts are fomented, and then perhaps poulticed. The limb must all along

be kept in a correct position, dead portions of bone must be removed when detached, and the strength supported by generous diet and wine. Opiates are of great use in alleviating the pains and twitchings in the limb. Poulticing is to be continued only for a short time ; in many cases it may be altogether superseded by fomentation ; and the latter should be used only when abscess is threatened, or when the patient is much pained at one or more parts of the limb. Support and gentle pressure are indispensable soon after evacuation of the matter, when no fresh collection is threatened.

The injury is often so great as at once to demand removal of the limb. There is no alternative, when, from laceration of the soft parts, superficial, deep, or both—comminution of the bone to a great extent—rupture of large vessels—and opening of joints—either gangrene or an overpowering suppuration are rendered not only probable but almost certain. The period at which the operation is to be undertaken requires judicious selection. Some patients are not affected constitutionally even by great and violent injury, such as dreadful laceration of the limbs ; whilst others, even after slight wounds, are affected with delirium, tremors, vomiting, lowness of spirits, depressed circulation, paleness of the surface, and appear on the eve either of rapid sinking or of immediate dissolution. In the first class of patients immediate amputation may be had recourse to with safety and advantage. In the second, the patient must be reassured, and stimulated both by external and internal means ; in short, reaction must be brought about, and then

let the surgeon operate. If he amputate before this, his patient will most probably die on the table, or very soon after his removal from it; reaction will never take place, and sinking of the vital powers is accelerated by the ill judged interference. A greater or less time is required for the occurrence of reaction in different individuals; the usual period is from two to six hours. Commencement of it is a sufficient warrant for operation; the surgeon must not delay till inflammatory fever has been lighted up, for then he will interfere with great disadvantage. He must then subdue the inordinate action as much as possible, and wait for the suppurative stage. When the patient has become hectic from profuse and long continued discharge, when perhaps no union has taken place—then also the limb must be removed. In civil practice, patients as often recover from secondary as from primary amputation. But according to the experience of military surgeons, the result is otherwise—many recover after primary and few after secondary; much may depend on the accommodation of the patient afterwards. A great deal is left to the judgment, discretion, and conscientiousness of the surgeon.

Fractures of the Cranium were treated of as connected with disturbance of the important organ which it protects. 11. 25. 4

The bones of the face are occasionally broken and displaced. *The frontal sinus* is sometimes opened

by fracture of the external plate. No small degree of force is required to effect this injury :—I recollect an instance of it, with opening into the sinus, occasioned by an attempt at suicide ; the man had struck his forehead violently with a large stone, wishing to knock his head to pieces. The integuments are generally divided, and during expiration, blood, sometimes frothy, is poured out through the opening. When there is no wound of the integument, emphysema of the forehead and eyebrows has resulted from disruption of the bones that compose this cavity, or others connected with the nostrils.

The ossa nasi are fractured and displaced by direct violence. They may be broken and comminuted without much displacement, or separated from their connexions and depressed without much fracture. Even slight cases are generally attended with laceration of the schneiderian membrane, and with profuse hæmorrhage from the nostrils. The soft parts over the bones are thin and tense, and consequently in many cases divided. Great swelling is apt to ensue, at first either bloody or œdematous. Inflammatory swelling to a great extent, both externally and internally, is to be dreaded and guarded against. Abscess of the schneiderian membrane, frequently of the septum narium, occurs from slight injuries, if neglected ; and, if not actively and properly treated, may terminate in loss of substance and consequent deformity of the features.

The existence of fracture of the *ossa nasi* is very readily ascertained ; the part is distorted, being either uniformly depressed, or hollow at some points,

and abruptly prominent and sharp at others. With the view of remedying deformity produced by displacement, and preventing the bad consequences already spoken of, the bones must be restored to their original position. They are to be raised by means of a strong probe or director, covered with lint, and introduced high into the cavity. Whilst, by means of this instrument, pressure outwards is made, the fingers of the surgeon are applied externally, so as to mould the organ into a proper shape. Unless force be again applied to the part, there is no risk of subsequent displacement; no apparatus is required to preserve the bones in situ.

In compound fracture the detached spiculæ are to be picked out, and the wound cleansed of blood and extraneous bodies; its edges are to be brought neatly together, and retained by one or more stitches, with slips of unirritating plaster. Inflammatory symptoms are to be warded off and combated by purgatives, antimonials, local abstraction of blood, and fomentations. Formation of matter in the nasal cavity is to be prevented, by scarification of the swollen membrane that fills the nostrils and precludes the passage of air; and if matter has been allowed to collect, it must be early discharged.

Opening into the frontal sinus, whether the result of accident or of exfoliation, may sometimes be closed by paring the edges of the integuments and bringing them together, or by covering the deficiency with a flap borrowed from a neighbouring part. Such measures should not be resorted to, in the case of open-

ing from accident, till after all inordinate action has subsided, otherwise adhesion will fail.

Cases of fracture of the *os malæ* and *zygoma* have been met with. Great displacement cannot occur, nor is any peculiarity of treatment required. It is sufficient to prevent motion of the divided parts, as much as possible, by the application of a bandage.

The *inferior maxilla* is exposed to violence, but from its construction and consistence is capable of resisting a great degree of force. It may be broken at various points; the usual site of fracture is where the canine or the first small molar tooth is implanted; but it not unfrequently gives way at the symphysis, or near the angle. The alveolar processes are often detached, with loosening of one or more teeth. The fracture is frequently compound; being produced by a direct blow, as the kick of a horse. The bone sometimes breaks at a part not struck, as at the symphysis from a blow near the angle. The accident is easily recognised; in fact, the patient, if sensible, has himself discovered fracture before he applies for assistance. There is distortion of the part, and the broken extremities, when moved, are felt grating on each other; there is discharge of blood, perhaps of teeth, from the mouth; and in compound fracture the ends of the bone are visible. At the symphysis the parts are not much displaced; they are more so when the fracture is in the site of the first molar. In the latter situation it is occasionally difficult to replace the bone, and retain it in its proper position.

The face swells to a greater or less extent, accord-

ing to the severity of injury done to the soft parts, and the time which has elapsed before reduction. The parts within the mouth swell; often there is great infiltration of the loose cellular tissue under the tongue. Sometimes extensive abscess forms, showing itself in the mouth or under the chin.

The bone is to be brought to its former shape by pressure of the fingers on the outside, and of the thumbs placed within the mouth on the corners of the teeth. Motion is prevented, and the parts are retained in their proper situation, by a wedge of cork or wood interposed on each side of the jaw, and grooved so as to receive the teeth both above and below. The wedges are placed with their thick ends anteriorly, and are retained by the lower jaw being firmly bound towards the upper; sufficient space for the introduction of food must be left between the wedges at the fore-part of the mouth. Pasteboard is applied externally, cut so as to fit exactly the fractured bone; it is previously softened in warm water, that it may adapt itself to the shape of the parts, and form a case over them; a thin layer of carded tow is placed between it and the skin, and the whole is retained by a roller, which is preferable to split cloths. The patient should not talk, or in any way attempt motion of the injured bone, and the food given should not require mastication. Inflammation is to be kept down by the usual means, and abscesses, if they form, must be early evacuated. Detached teeth and splinters of the jaw are to be extracted at the first; if teeth loosen during the cure, they should be considered as foreign bodies and removed, otherwise

they will keep up the discharge and tend to prevent union. From three to six weeks is generally sufficient time for consolidation of the fracture. In severe cases union may be prevented by necrosis of part of the bone; or, though the bone unite, the external wounds may not heal, and the discharge may continue till the dead portions separate and are discharged.

Fracture of the Spinal Column is attended with alarming symptoms, and often terminates fatally, from the pernicious effects necessarily produced on the spinal chord, either immediately or consecutively, when the bones forming the column are disjoined to any great extent. The injury is effected by great violence—by the body being projected and alighting awkwardly—by a fall on the breech from a height, the head and trunk being bent forcibly forwards—by direct blows on the spine.

Displacement of the bones forming the spine seldom takes place without fracture to a greater or less extent. Pure dislocation of the spine, from the rupture of ligaments and fibro-cartilage, is a very rare accident; few cases of it are on record, and in them the injury was in the cervical region; I have only met with one instance of complete and pure dislocation. The ligaments are of great strength, and the bones yield sooner than they; and in the greater number of severe injuries of joints this is the case more or less.

Either the bodies or the processes of the vertebræ are broken, and sometimes comminuted; occasion-

ally the bodies are broken entirely through, with considerable displacement, the upper or lower end, as may be, projecting. There is twisting or bending of the trunk or neck, the articulating processes on one side only being displaced, whilst the ligaments on the other remain pretty entire. In some cases, either the spinous processes, or the articular, are separated without yielding of the bodies of the vertebræ, or of the interposed substance; then there is bending of the trunk forwards.

The symptoms vary according to the site of the injury, and the extent of violence inflicted on the spinal chord. This important organ may suffer concussion without fracture or displacement of the bones, its functions may be consequently more or less disturbed, and paralysis occasioned of those parts that are supplied with nerves from below the injured point. Without fracture, too, vessels may give way within the canal, and by compression from effused fluid urgent symptoms will be produced.

The power of motion may be lost whilst sensation is retained, and *vice versa*; but in general both are either impaired or destroyed. In one case that I attended, there was power of motion in one limb and no sensation, whilst in the other there was no motion but the usual sensation.

Patients may recover from the effects of a severe blow on the spinal column and consequent concussion of the chord, but very frequently they do not. Changes may take place at a late period in the chord or its membranes, in consequence of the injury—as thickening of the coverings—bloody, serous, purulent, or

lymphatic effusion—disorganisation and softening of the medullary matter, with urinary symptoms. Inflammation of the membranes, or of the chord itself, may supervene, either very soon after the accident, or long afterwards ; its intensity and period of accession will depend on the extent of the injury, and on the treatment. The muscles act spasmodically, the circulation is excited, the sensorium and nervous system are disordered, delirium ensues, and is followed by paralysis and coma.

In some cases of displacement, even to no small extent, the spinal chord escapes being bruised, torn, or compressed ; no bad symptoms may ensue ; or paralysis to a greater or less degree occurs and gradually goes off, probably occasioned by bloody effusion, which is afterwards absorbed. This I have experienced in several instances—in a boy who fell over a high rock—in a woman who fell from a window ; both lighted on the breech, and the trunk was bent forwards. The lad remained stout, but his trunk was somewhat deformed by an excurvation ; the woman recovered perfectly. In these cases there was evidently laceration of the interspinal ligaments, though probably not of the ligamenta subflava, for the spinal chord must be stretched or otherwise injured when these are torn.

The chord is more or less injured in the majority of cases of fractured spine. If the injury occurs high in the cervical region, immediate death ensues, from compression or laceration of the medulla oblongata. Respiration is arrested by compression or destruction of the chord above the origin of the phrenic and other

respiratory nerves. If the chord is injured in the middle of the cervical region, there is paralysis of the upper and lower extremities, with distension of the bowels, and inability to void the urine; the lower bowels have become insensible to the stimulus of distension from want of their nervous energy, and the sphincter ani is paralysed. The bladder becomes distended, and then incontinence of urine follows; and frequently there is priapism. The quality of the urine is changed, the secretion of mucus from the bladder is vitiated and increased. Slow inflammation of that organ is induced, the urine becomes bloody and mixed with ropy mucus; lymph is deposited on the lining membrane.

Bruises of the loins often lay the foundation for degeneration and abscess of the kidney, with many of the symptoms of calculus vesicæ, attended with red tongue and hectic, and ultimately terminating fatally.

The effects of concussion of the spine are frequently developed long after the infliction of the injury. There is formication, numbness, and difficulty of regulating the motions, in one or more limbs. Still the muscles are not shrunk, nor unable to perform powerful movements; but the patient cannot put his hand or foot to the place he wishes, and cannot support the weight of the body without assistance. Sensation in the limbs is lost to a greater or less degree, their heat is diminished, and it is found difficult to preserve their temperature equable. The symptoms increase till the limbs become totally useless. Along with the lower limbs the bladder is affected, though not always. The urine is not voided with force, and incontinence oc-

curs from distension. Sometimes excitement of the viscus follows ; the secretions from its surface are increased, and often mixed with blood. Yet patients survive long under such circumstances, digestion and the other important functions are well performed, and the intellect is unimpaired.

Prognosis in injuries of the spine is unfavourable, as well as in disease of the column, whether the result of injury or not.

From the treatment much need not be expected ; but still no chance is to be thrown away, even in the most unfavourable cases. The attention must be directed towards alleviation of the symptoms. The comfort of the patient must be looked to in regard to the situation of the injured bones and other parts, even where there is reason to believe that the chord is lacerated or completely divided, and that there is no chance of recovery. In less severe cases, by placing the injured parts in their proper position, and retaining them by splints placed along the sides of the spinous processes ;—by keeping down inflammatory action, palliating all the symptoms as much as possible, and attending to the state of the bladder if necessary—unlooked for recoveries have taken place.

It has been proposed to treat the spine, in cases of severe and alarming fracture, in the same manner as the cranium—by trephining ; and some have recommended this in almost all kinds of injuries. I allude to the practice only to condemn it. And further notice of it is unnecessary, seeing that, as far as I know, it has been unanimously discarded by the profession from amongst the list of surgical operations.

When the patient has borne up against the shock of the injury, and the more immediate consequences, and when partial loss of sensation and motion has supervened, great benefit is obtained from counter irritation, by blisters, issues, or moxa. But these are not advisable, but to a certainty injurious, till after time has been allowed for subsidence of the immediate effects—for union of the divided parts, and disappearance of acutely excited vascular action. The endermoid application of strychnine is also efficacious in many cases where the injury has been slight—as in the following. A young man was struck on the back of the neck with a leaden plummet. The immediate effects were loss of power and sensation in the whole body. The use of the upper limbs was regained gradually and completely; and when he applied to me, the remaining symptoms were diminished sensation and irregular muscular action in the lower limbs. The mode of progression was very remarkable; supported on the points of the toes and assisted by a staff, he made two or three quick steps as if running, and then suddenly stopped, a few more rapid steps and another abrupt halt, and so on. A succession of small blisters was applied along the sides of the spine in the dorsal and lumbar regions. On the raw surface strychnine was sprinkled, commencing with half a grain daily, and gradually advancing to a grain and a half. He made a perfect recovery in less than three weeks.

In another patient, in whom sensation in one limb without motion, and in the other motion without

sensation, remained after severe injury of the spine by a fall from a high window, complete recovery was obtained by the internal use of strychnine, and repeated application of the moxa.

Slow degenerations of the spinal chord are not easily combated with success. Considerable changes of structure have taken place, as shown by the symptoms, before the patient becomes alarmed and applies for relief. He has had a feeling of distension about the lower part of the bowels, and, voiding his urine with some difficulty, perhaps suspects stricture of the urethra as the cause. He lifts his feet awkwardly, sets them down clumsily, and all of a piece; his knees totter, there is no feeling about his buttocks, and a numbness round the anus. At length he is for the first time alarmed by incontinence of urine having supervened, or by the limbs having sunk under the weight of the trunk, and come to the ground with violence. The remedial means are local abstraction of blood from over the seat of the disease, followed by friction and counter-irritation. Strychnine may be tried in some cases. But it is indeed seldom that the progress is satisfactory.

Fracture of the Clavicle. This bone is liable to be broken by indirect violence, as by falls on the point of the shoulder, from horseback, or from the top of a carriage; or by a fall with a carriage, the person being inside—of this accident I have met with three or four instances. It may also be broken by direct violence, as by a blow on the bone, or by the person

striking it against a hard substance in a fall. It generally gives way about the middle. The fracture, when occasioned by force applied to the acromial extremity, is usually oblique; transverse when the force is applied to the shaft of the bone. The displacement is in most cases great; but when the fracture is at the bend near the scapular extremity,—a not very uncommon accident,—disjunction of the fractured extremities is prevented by the attachments of the conoid and trapezoid ligaments. In ordinary cases, that fractured extremity projects which is attached to the sternum, whilst the scapular portion is depressed and carried inwards. In short, the scapular portion is displaced, the sternal is nearly in situ; though, from the depression of the former, the prominence of the latter appears to be displacement. The arm falls forwards and downwards.

The fracture is sometimes compound. The wound is generally small, and occasioned by the projection of the sternal portion; or the integument may be divided by the external force.

The nature of the accident is readily recognised. The deformity is very apparent. There is swelling, from extravasated blood, over the bone; the shoulder is unnaturally approximated to the chest, and depressed. The motions of the extremity, those above the shoulder, are impaired. Crepitation is felt on raising the arm, and carrying it backwards so as to bring the fractured surfaces into contact.

When the patient is seen immediately after the accident, the bones are to be placed in apposition, and

retained, without delay, and before inflammatory swelling has come on. No complicated apparatus is required. A pad, firm, though of soft material, and large enough to fill the arm-pit completely, is rolled in a shawl and placed in the axilla; it is retained by tying the shawl over the opposite shoulder, a soft pad being interposed between the knot and the skin to prevent excoriation, and is farther secured by tying the ends under the axilla of the uninjured extremity, which should also be protected by a small cushion. A few turns of a roller, or a handkerchief, are placed round the arm and chest, so as to secure and fix the limb; so the retentive apparatus is completed. The shoulder is thus raised, and removed from its unnatural position; and the fractured extremities of the clavicle, previously placed in accurate contact, are prevented from being again displaced. The elbow and forearm should be supported by a sling, otherwise the unsupported weight of the limb dragging on the shoulder will cause considerable pain, and subsequent displacement will be apt to occur. The apparatus should be looked to occasionally, adjusted and tightened; and the cushions should be replaced by fresh ones, to prevent excoriation and uneasiness. The bone will be found to lie quite smooth, to remain of its proper length, to unite, generally within twenty days, and that without any unseemly exuberance of callus. No evaporating lotions are necessary. No compresses or splints need be applied over the bone. If the patient be bruised in other parts, and become feverish, it may be requisite to abstract blood and exhibit an-

timonials, purgatives, &c. But all inflammation, arising from the fracture, subsides on the accomplishment of reduction, adaptation, and retention of the portions. If the fracture be compound, the edges of the wound should be brought together and retained, so as to favour immediate union.

The *body of the scapula* is broken, generally by a severe injury of the chest, as by a hard and heavy body passing over it. There is little or no displacement; and the accident is not easily detected, more especially after swelling has taken place.

It is sufficient to restrain motion; and this is effected by passing a bandage round the chest, over the scapula, and round the arm.

The *acromion process* may be broken off; but the accident is rather uncommon. The fracture is produced by direct violence—a blow or a fall on that point. The *spine* of the bone also is sometimes broken by a like cause. Portions of the acromion may be separated along with the ligaments connecting the clavicle to it, in the accident of dislocation of the scapular extremity of that bone. The acromion is occasionally broken into fragments by heavy falls on the point of the shoulder.

There is a slight appearance of flattening of the shoulder at first, and then great swelling. Crepitation is felt by pressing gently and alternately with the points of the fingers over the fractured part.

The arm requires to be raised and supported by a sling.

Fracture of the Ribs. One rib, or more, may be broken by injuries in various ways—by blows of the fist—falls on hard bodies—pressure on the chest by heavy bodies passing over or falling upon it. They generally give way anteriorly to the angles, at the most convex point; but sometimes near the spine or the sternum. At the same time they may be partially luxated at either of the extremities. The fracture is generally transverse; occasionally, and rarely, oblique. Sharp portions are seldom detached. The skin is sometimes divided, but more frequently the pleura and lungs are torn by the spiculæ projecting internally; hence effusion into the chest, and emphysema of the sub-cutaneous cellular tissue near the fracture, take place. The emphysema, if permitted, extends over the greater part of the chest, and even farther.

Fracture of the ribs is attended with pain, particularly during full inspiration; and if the injury is severe, the patient is incapable, without great pain and exertion, of accomplishing full inspiration. He uses his handkerchief, sneezes, and coughs, with the utmost difficulty. Crepitation is felt by the patient, and is easily detected by the surgeon, by placing the hand on the suspected point, and desiring the patient to attempt full inspiration so as to grate the surfaces on each other. Motions of the trunk, and often of the upper extremities also, are attended with aggravation of the symptoms. In some cases attentive examination is necessary to discover crepitus—in certain situations, and when perhaps one rib only has

given way, especially if some time have elapsed betwixt the infliction of the injury and the application of the patient for relief.

In the slighter cases, it is sufficient to restrain the motions of the chest by a broad bandage applied firmly round it; and a split cloth, or a scapulary, may be passed over the shoulders and attached to the circular bandage to prevent its being displaced. Great and immediate relief is thus afforded. In those of a plethoric habit, blood may be taken from the arm, some hours after the injury, with relief and advantage; it may ward off an inflammatory attack—and it is absolutely necessary to adopt this practice on the slightest indication of such supervening. The appearance of the countenance, and the state of the pulse and respiration, must be watched; and on the first becoming anxious, the second strong and accelerated, and the third hurried and imperfect, active measures must be employed—venesection, antimony, purgatives, diaphoretics, anodynes—one or all according to circumstances. In the more severe injuries the same practice is pursued; and the symptoms are watched with great care. The air in the cellular tissue, if effused in great quantity about the neck and face, and interfering with the functions of the parts, is to be evacuated by punctures. If the emphysema is slight, and confined to the neighbourhood of the injured part, farther extrication is prevented by the timeous and accurate application of a bandage; the air already in the cellular tissue speedily disappears. The effusion

into the chest is also in general absorbed ; but it may remain and increase, and from violence of action purulent secretion may be mixed with the serous. The breathing then becomes embarrassed, the chest swells, and the integuments are œdematous. The action of the lung is either much impaired or entirely arrested, as is ascertained by auscultation. In such circumstances, evacuation of the effused fluid may be required.

The *Sternum* is sometimes fractured, or, in young persons, the bones composing it disjoined ; but the occurrence is exceedingly rare. The displacement is not great ; and is rectified by changing the position of the trunk. The same treatment is required as for fracture of the ribs. Abscess has formed under the bone, as the result of the injury ; but by antiphlogistic means, local and general, this may be in most cases prevented.

Fracture in the vicinity of the Shoulder-joint requires to be most accurately examined, that a correct diagnosis may be formed, and the practice be judicious and decided.

Portions of the upper part of the humerus are torn off, along with the attachments of the short muscles, during violent exertions, particularly if the limb is in an awkward position. This is followed by want of power, great swelling, and considerable deformity. Some indistinct crepitation is perceived ; the articulation is afterwards stiff, and the bone of an

unnatural form. But these indications of the injury gradually disappear.

More extensive solution of the continuity of the bone takes place, generally in consequence of a direct and violent blow on the shoulder. The patient is unable to raise the arm, though with great pain it can be placed in any position that it occupies naturally; it can be abducted and raised, perhaps to a greater extent and more readily than when sound. The shoulder is flattened, and the limb apparently lengthened. The elbow is readily put to the side. On raising the humerus, rotating it, and moving it to and fro, crepitation is distinctly perceived—but not so readily after swelling has taken place. The swelling also obscures the appearances observed immediately after the infliction of the injury,—the flattening of the shoulder, and apparent elongation of the arm. By the fingers of one hand, pressed deep into the axilla, the head of the humerus can be discovered; and on rotating the shaft of the bone with the other hand, grasping the elbow and pushing upwards at the same time, crepitation is perceived, and the upper portion of the bone is ascertained to be unaffected by the rotation of the shaft. The nature of the injury is then sufficiently apparent.

But the shaft of the humerus may, by such manipulation, be ascertained to be entire. Still, from the direction of the force which effected the injury, the flattening of the shoulder, the remarkable falling down of the arm, the loss of power, the free motion, and from the crepitation, though perhaps indistinct,

it is evident that fracture has occurred. Then, by the fingers in the axilla, whilst the humerus is raised and moved in different directions, crepitation is recognised deeper and less distinct than in the former case; and the surgeon is warranted in believing that the glenoid cavity has suffered—that it is broken into fragments, or that it is separated from the body of the scapula by fracture of its neck: he is also warranted in adopting the means of cure suitable to such an accident. Many such injuries occur, yet it is strange that preparations illustrative of it are scarcely to be met with in our collections of morbid specimens.

How both detachment and luxation of the head of the humerus should occur, can scarcely be explained. Luxation certainly cannot take place after fracture; no force can be applied to the head of the bone sufficient to displace it. It is barely possible, that after luxation, force may be applied to the bone so as to fracture its neck. This accident is of very rare occurrence, though by some supposed to be otherwise. I have had an opportunity of examining but one case, and that was very distinct; the head of the bone, completely detached from the shaft, lay in the axilla. Comminution of the head of the bone, with displacement of the fragments, is not uncommon.

Separation of the head of the bone occurs occasionally in young persons, presenting the same appearances and symptoms as fracture of the neck of the humerus in later life. Each, by a little care, is distinguishable from dislocation, even after swelling

has supervened. And it is highly necessary that the diagnosis should be correct and prompt, otherwise atrociously cruel and unnecessary proceedings will be adopted, and irreparable mischief occasioned. Luxation is attended with flattening of the shoulder and elongation of the arm, to a greater or less degree, according to the position of the head of the bone. But the elbow does not come to the side, and the motions of the limb are abridged; it cannot be abducted to any extent, if the scapula is fixed. The head of the bone is felt under the pectoral muscle, or in the axilla; and on rotating the arm gently, by laying hold of the forearm, and using it, when bent, as a lever, the head and shaft are found to move simultaneously, all of a piece, and no crepitation is felt. Besides, the history of the accident is an excellent guide towards correctly ascertaining the nature of the injury. If the patient, in falling, have involuntarily stretched out his arm, in order to save himself, and alighted with his whole weight on the palm or elbow, dislocation will most probably have occurred. If, on the contrary, he have pitched upon the shoulder, without any intermediate breaking of the fall, fracture is to be expected.

The evil consequences of false diagnosis, and of treatment formed thereon, are very apparent. A dislocation may be put up and treated as a fracture, perhaps till too late for reduction; and the patient will possess but weak and imperfect motion of the limb, after having undergone long suffering. On the contrary, dreadful torments are inflicted on the patient

when fracture is treated as luxation. The force applied with the view of reduction is in all circumstances very painful, but, when exerted on a fractured bone, must prove absolute torture; and during the whole treatment, the fragments are every now and then torn separate, and union so prevented. Severe inflammatory action follows the reductive violence, and is kept alive or regenerated by the loose and projecting fractured ends of the bone; extensive suppurations, attended with fever, ensue, and may destroy the patient. Undetected fracture may also be treated as a bruise of the soft parts only; then every motion of the body and limb is productive of excruciating pain, and there is much risk of uncontrollable inflammation being excited—all which would have been warded off, by placing the bones in a proper and steady position; the adaptation of a pad in the axilla is followed by immediate and great relief. Such mistakes are quite inexcusable. By one careful examination,—productive of considerable uneasiness to the patient in some conditions of the parts—the real state of matters should be ascertained; and then the practice founded on the knowledge so obtained will be followed with speedy cessation, or at least great diminution of pain, and with every probability of restoring the limb to strength and usefulness.

Fractures of the glenoid cavity, of the neck of the scapula, and of the neck of the humerus, are all treated by the same simple, though effectual, apparatus as employed for injuries of the clavicle. It re-

quires to be re-adapted occasionally, to have the parts under the crossings of the bandage, and under the knots of the shawl retaining the pad, well protected by soft pads, and must be worn for four or five weeks—perhaps, in some cases, even a short time longer. Then gentle passive motion of the limb is to be employed, gradually increased as the painful feelings abate. If the parts are at once placed in apposition, and accurately retained, no abstraction of blood, either general or local, is required at the time, and is not likely to be called for during any stage of the treatment. No cold evaporating lotions are necessary; fomentations are sometimes useful.

Fracture of the Shaft of the Humerus is either oblique or transverse, according to the direction of the force applied. There is considerable displacement. The limb is always shortened to a certain extent, and the natural contour destroyed; the arm is useless, and bent towards the trunk, and the muscles are in a state of spasmodic contraction. The nature of the injury is at once and readily recognised. There is unusual and unnatural mobility of the arm, and distinct crepitation at the fractured point. There is great pain from the pressure of the lower extremity of the bone upon the nervous trunks. The large vessels are seldom torn—though the branches of the humeral artery, and the vessel itself, have in a few cases been ruptured—but there is often considerable bloody swelling in this as in all fractures. Occa-

sionally, when the violence has been great, either the upper or the lower fractured end is thrust through the skin.

When the inferior part of the shaft is broken, there is less displacement than when the fracture is towards the middle of the bone. Fracture above the condyles sometimes extends through them ; and the one may be detached from the other, either with or without fracture of the shaft. When such an accident is suspected, the position of the condyles in regard to the ends of the bones of the forearm should be accurately observed. Flexion and extension of the forearm can be readily performed, though with pain ; not so, when the bones are luxated. Crepitation is detected along the line of fracture, during motion of the limb, and when the condyles are laid hold of and moved upon each other, or on the shaft.

In fracture of the middle of the shaft, coaptation is easily accomplished ; slight extension is made by one hand grasping the elbow, whilst, by the other, the bones are brought together, and the straightness and outline of the limb restored. The proper position is readily maintained by two splints of bookbinders' pasteboard, one applied from over the acromion process to beyond the point of the elbow, the other from the axilla, and also passing over the elbow on the inside ; thus the neighbouring joints are fixed, and the muscles rendered inactive. The conjoined breadth of the splints should be sufficient to embrace the limb almost entirely ; some space

being left, so that when the swelling subsides, they may neither meet, and consequently lie loose, nor overlap each other. They are softened by steeping in hot water, so that they may embrace every part of the limb to which they are applied; and the extremities should be rounded off, to prevent galling of the parts. They are padded with soft flannel or lint, or, what is better, with finely carded tow, and retained by a circular roller applied from the points of the fingers up to the shoulder. The binding should proceed from below upwards, to avoid swelling from obstructed circulation, and do away with the necessity of removing the apparatus arising from this cause. It is well to place a wooden splint on the outside, retained by an additional bandage, so as to steady the parts till the pasteboard has dried, and formed a firm mould or case for the limb; then the wood is unnecessary, and should be removed. The forearm is bent at right angles, and the humerus fixed to the trunk. In simple fracture, there is in general no necessity for interfering with the apparatus until the bandage slackens, in consequence of the swelling subsiding; then, usually at the end of eight days, it is to be reapplied. One splint is carefully raised, whilst the other is kept fixed and the parts steadied, and the limb is ascertained to be straight and of a proper length; if not, then, or even later, the position of the bones may be rectified without causing much uneasiness. A simple fracture need not confine the patient to bed; he may walk about with the arm supported in a sling.

In compound fracture similar splints are applied, after due attention has been paid to the wound and to the position of the bones. The patient is placed on his back in bed; and the splints are retained by slips of bandage, double, one end being passed through the loop and secured to the other by a running noose. This method of deligation affords facility for the removal of the splints, in order to examine into the state of the limb and dress the wound. It also permits of the apparatus being slacked in the first instance during the swelling, and of being afterwards tightened, without lifting the limb or disturbing its position.

Fracture at the distal extremity of the humerus is managed most conveniently with the limb in the straight position. The fragments are placed accurately together, and one splint placed on the fore part, another posteriorly. The forearm is kept in a state of supination. At the end of about twenty days the apparatus should be removed, and the position of the articulation changed if possible. The forearm is to be bent slightly, and a splint applied,—made to fit accurately, and with a joint corresponding to the bend of the arm. This should be occasionally removed, provided consolidation of the fractured bones has advanced so far as to admit of it, and slight passive motion of the elbow-joint employed. Obstinate rigidity of the parts is thus guarded against.

Fracture of the condyles has been already alluded to. It may be farther observed, that the exact nature of the accident is often difficult to detect; in all

cases accurate and careful manipulation is required. Displacement of one or other of the bones of the forearm almost uniformly attends this fracture, sometimes rendering diagnosis obscure.

Fracture of the *olecranon* process of the ulna is occasioned by falls on the point of the elbow ; or the bone may be snapped asunder by powerful and sudden action of the triceps extensor cubiti, when the arm is much and quickly bent. The injury is readily recognised ; there is inability to extend the forearm by its own muscular powers, a considerable space is felt between the separated portions of the bone, and the upper fragment is movable as well as detached ; these marks of the injury are rendered more conspicuous by bending the joint. Crepitation is produced by moving the limb when extended, and the separated parts thereby approximated. Bloody swelling soon takes place, large and extensive when bruising of the soft parts has been great—and this is usually the case, in consequence of the injury being almost always the result of direct violence. In some cases the process is comminuted.

Compound fracture is rare, and likely to be productive of serious consequences. I have treated and witnessed several cases. In one the process was cut off by the patient falling on an earthen vessel, which broke under the limb. The joint is necessarily opened. Violent inflammation soon commences, and can very seldom be kept within moderate bounds. Dis-

charge of increased and vitiated synovial secretion takes place, followed by profuse and unhealthy suppuration. The cartilages ulcerate, and then the bones. The cellular tissue around becomes infiltrated, the parts swell and are discoloured, and collections of matter form probably at more points than one; perhaps there is a succession of abscesses. The condyles, and often a portion of the shaft of the bone, are denuded by the suppuration, and superficial necrosis results. Ultimately the patient grows hectic. Amputation had to be resorted to in all the cases which have come under my observation, weeks or months after the accident.

Union of the simple fracture will take place by bone, if the portions be retained accurately and permanently in contact; but there is a risk of the joint remaining stiff, and of re-separation being produced by even slight violence. Union by ligament is as rapid as that by osseous matter; and if the ligament is short, the arm is quite as useful. Approximation of the broken surfaces is favoured by extension of the elbow joint, the triceps muscle being thus relaxed. The position is preserved by a splint placed on the fore part of the limb, extending from the middle of the arm to the lower part of the forearm, and retained by a roller applied, not over-tight, from the fingers upwards. The application of apparatus to the separated portion, with the view of forcing it into contact with the shaft of the ulna, is useless. The figure of 8 bandage, and such like, are

hurtful. Permanent relaxation of the triceps, with prevention of motion, is sufficient. This is continued for three or four weeks ; by that time the fracture will in all probability have united, and then gentle and gradual passive motion of the joint is to be commenced.

In compound fracture the prognosis is always unfavourable. Means must be taken to avert incited action—the limb must be properly placed without delay, the edges of the wound accurately approximated, and antiphlogistic measures pursued. Purulent collections must be opened early. Rest of the joint is to be ensured, and support afforded, by bandaging—perhaps by the application of plasters and a splint. The patient will be fortunate if he escape mutilation by the amputating knife.

Fractures of the bones of the *forearm*, of one or both, are common ; generally simple. The *Radius* may be broken at various points—at the upper part—near its head—at the middle—most frequently near the distal extremity. At the two first points the fracture will probably have been produced by direct violence ; but near the carpus, it is usually the result of force applied to its extremity, as by falls in which the weight of the body is thrown on the palm of the hand. The *ulna* is usually broken by force directly applied, as when the arm is brought in contact with hard bodies in falls. By direct violence also, both bones may give way about the middle, and at corresponding points ; or, when force is applied in the

direction of the bones, the ulna may be found broken near the wrist, and the radius near the elbow.

When one bone is broken, there is little displacement. The power of motion is lost to a considerable degree, and there is some deformity, but little or no shortening. The existence of fracture is ascertained by tracing the bones with the fingers, and by gently rotating the limb; the broken portions moving on each other produce distinct crepitation. When the radius is broken near its middle, the forearm is kept pronated, and the broken extremities are drawn towards the ulna; by bringing the limb towards the supine position, the ends come together, and the one bone is removed from the other. Fracture of the radius near the distal extremity produces displacement of the wrist, with great deformity; and this is increased by bloody effusion into the sheaths of the tendons, and into the superficial cellular tissue. In fracture of both bones, there is much deformity and shortening of the limb; the power of moving the hand is lost; the muscles are bruised and torn, and great swelling soon results.

There is little difficulty in remedying the slight displacement which takes place when but one bone is broken, and in retaining the parts in a favourable position. When both have given way, slight extension is required, and the forearm is placed in the middle state between pronation and supination. Two pasteboard splints, softened in hot water, and padded with tow, are applied, one on each aspect, from a little above the elbow to over the fingers; the outer

should extend to the tips of the fingers, the inner need not pass the palm ; they are retained by a roller. In fracture of both bones, a wooden splint should be retained on the outside of the limb for a few hours ; but this precaution is scarcely required when but one has suffered. Similar treatment, along with attention to the wound, is required in compound fracture.

The *metacarpal* bones and *phalanges* of the *fingers* are subject to fractures, both simple and compound: The metacarpal bone supporting the little finger most frequently suffers from force applied to the knuckle, as in pugilistic encounters. The other metacarpal bones are occasionally broken from crushing of the hand, as by a heavy body falling on it, or by its becoming entangled amongst machinery. The injury is readily ascertained by moving the fingers, and pressing in the course of the bone. On laying hold of the distal end of the bone suspected to have given way, placing the fingers over the shaft, and attempting slight motion, distinct crepitation is perceived. For the cure, motion of the parts must be prevented for a sufficient time, and inflammation warded off when threatened ; there is little or no displacement, and consequently retentive apparatus can be almost wholly dispensed with.

Simple fractures of the phalanges are recognised and treated by even the most unlearned in the surgical profession. The deformity is so striking as to render mistakes as to the nature of the accident im-

possible; reduction is accomplished without difficulty; and the bones are kept in their proper places by a small splint, either of wood or pasteboard, placed on each side of the finger, and retained by a narrow roller.

Compound fractures of the phalanges are almost uniformly followed by most violent inflammatory action in all the tissues, terminating in disease of the joints, and in death of the tendinous and fibrous tissues. The suppuration is profuse and unhealthy, and the infiltration of the soft parts extensive. The diseased action not unfrequently pervades the palm of the hand. In the great majority of cases, necessity for amputation arrives sooner or later.

Fracture of the bones composing the *pelvis* occasionally takes place, but can be produced only by the application of great force, as by a loaded vehicle passing over the body, or by falls from a great height. The accident is usually attended with serious injury of the viscera contained in the pelvic cavity, or in that of the abdomen; they may be either ruptured, or lacerated by sharp projecting spiculæ, or merely bruised. The nature and extent of the injury is not easily ascertained. There is great pain on motion of the body or of the limbs, and usually extensive extravasation of blood in the soft parts; these circumstances, along with the symptoms that may arise from internal organs which have been injured, and a knowledge of the way in which the injury was inflicted, lead to a strong suspicion of fracture of the pelvis.

A portion of the crest of the ilium may be broken

off, without serious mischief ensuing, and may unite favourably. More extensive fractures, deeper in the pelvis, as in the neighbourhood of the acetabulum, are attended with excruciating pain on the least motion; in these the existence of fracture may be suspected from the first, but the extent of the injury is not fully known till after death. Fractures near the symphysis, and of the rami, either of the os pubis or ischii, are usually attended with injury to the bladder, or to the urethra. Wound of the bladder is almost necessarily fatal, extravasation of urine, with all its fearful consequences, taking place in the loose cellular tissue connecting the upper part of the viscus to the parietes of the pelvis, and in the cellular tissue behind the peritoneum. The urethra may be lacerated by the sharp edge of fractured bone, or it may be ruptured by direct violence applied to itself. The latter case sometimes accompanies partial diastasis of the symphysis, produced by the person falling astride on a beam. Either injury separately is sufficiently dangerous, and a patient with both is in a very precarious situation. Great extravasation of blood takes place in the perineum, scrotum, penis, and tops of the thighs, infiltration of urine quickly follows, retention supervenes, abscesses form, and the patient perishes under a train of symptoms already detailed when treating of the urinary organs.

The treatment is seldom satisfactory. Absolute rest must be procured, and with this view the limbs are to be secured, and a broad band passed round

the pelvis. The state of the viscera must be attended to; collections of matter must be evacuated; and all other untoward symptoms must be actively met, and their consequences either averted or got over as far as possible.

Fracture of the *Sacrum* is uncommon, as also detachment or fracture of the *Coccyx*. The former accident happens in consequence of a fall from a great height. There is little or no displacement whether the fracture is transverse or longitudinal; sometimes there is splintering of the bone. Acute pain is occasioned by motion of the limbs and of the trunk, and by pressure over the injured part. Abscess is apt to follow, both under the integument, and in the concavity of the bone, and the chief duty of the surgeon is to prevent this if possible.

Fractures of the *Thigh*.—On account of the thick muscular covering, much attention is required to enable the surgeon to form an accurate diagnosis regarding the effects of an injury of the upper part of the femur. The necessity for ascertaining what the injury really is, need not be insisted on. Consequences dreadful to the patient have too often followed blunders in diagnosis. As in the accidents of the shoulder-joint, some idea as to the exact injury may be formed by ascertaining how the force was applied; but this, alone, may sometimes mislead. Careful manipulation is to be chiefly trusted.

Fracture within the capsule is met with most fre-

quently in those of advanced age, when the form of the neck of the bone has been altered,—when it has become shorter, and attached less obliquely to the shaft; the bones, too, are then more brittle than in earlier life. The accident often happens from slight force, applied either to the farther end of the bone or to the trochanter, as by a fall in going up or down a stair. Though the height be not great, yet the patient's energies are weakened and he can make no effort to break the fall, and the weight of the body is thrown on either the fore or the back part of the trochanter. Though the fracture, in such an accident, generally extends beyond the capsule, and the processes are broken to a greater or less extent, yet occasionally the head of the bone is separated by transverse break of the neck without farther injury. This fracture occurs sometimes in those of middle life; and even in children, separation of the head of the bone may on good grounds be supposed occasionally to take place.

The marks of fracture within the capsular ligament are inability to move the limb, pain about the joint on attempts being made to move it, and shortening to a slight extent, as ascertained by comparison with the sound limb; the patient being laid straight on his back, with the crests of the ilia in a line, either the knees or the ankles are looked to, and the comparative length of the limbs thereby observed. In some cases, neither shortening nor deformity is apparent for some time after the accident; there is merely want of power, and crepitation produced by

rotation; but retraction of the thigh would after a time inevitably occur, and has done so when the nature of the injury was not at first ascertained, nor proper treatment adopted. Most frequently there is eversion of the toes, and to a considerable extent; sometimes there is inversion, and this is owing to the limb either having been placed in that position in falling, or having acquired it after the injury has been inflicted. The rotators outward are the more powerful; the limb naturally inclines outwards, and when in the recumbent posture, the weight of the foot favours eversion. But in fracture the muscles do not act as in a sound limb; and when the limb is once placed, the patient will not by his own efforts alter the position. Thus it is that inversion not unfrequently happens in this form of fracture, although the opposite state is that which, from a consideration of the muscles involved, is a priori to be expected. In inversion the limb presents somewhat of the appearance arising from the most common luxation; but it possesses greater mobility, and has not the want of prominence occasioned by displacement of the articulating extremity of the bone. The facility of lengthening the member, and the crepitation felt on a proper and more attentive manipulation, will remove all doubt.

On examining the injured hip, motion to any extent can be effected, though with excruciating suffering to the patient. On stretching the limb to its original length, and then rotating slightly, crepitation can be felt by the hand, or heard by the ear, placed over the trochanter major.

Fracture is much more frequently met with outside of the capsular ligament, generally passing obliquely through the trochanters, and communicating with fissures in various directions. Splinters are often detached, and sometimes the small trochanter is broken off. Here, also, there is inability to move the joint, violent pain on attempting it, swelling, and deformity of the member; there is shortening to a greater extent than in the fracture within the capsule; there is free motion in all directions; rotation, abduction, adduction, flexion, and often extension, can be effected to an unnatural and unusual extent—the degree of motion is no longer limited by the ligamentous attachments of the head of the bone. Here, also, the limb is most frequently everted, but occasionally inverted; and that even when, from the direction and extent of the fracture, neither the rotators outwards nor the rotators inwards have been deprived of action.

In some cases of fracture, partly within and partly without the capsule, all the usual marks of this injury are present, but it is impossible to move the limb without employing considerable force. This arises from the broken portions being jammed together, the neck of the bone being, as it were, driven into and wedged in the cancellated texture of the trochanter major, or of the upper part of the shaft.

The trochanter major is sometimes, though rarely, detached, without separation of the neck of the bone from its shaft. In this injury there is apparent lengthening of the limb, and flattening of the hip;

the patient is able to use the member, though not freely. Before swelling has taken place, crepitation can be perceived on laying hold of the trochanter whilst the limb is in motion ; and the trochanter itself is found to be in a slight degree movable.

Fracture of the upper part of the shaft is attended with immediate and great shortening ; the limb is much mishapen, and lies on its outer side, with the knee partially bent. The upper fragment of the bone projects ; the resistance to the action of the psoas and iliacus is in a great measure done away with, consequently these muscles raise the upper, whilst the lower end falls back and is drawn upwards behind the other. In mismanaged cases, I have found on dissection the lower end of the bone lying in the sacro-ischiatic notch, and a process advancing very different from reparation—necrosis. The marks of this accident are so conspicuous, that the surgeon is satisfied of what has happened without enquiring for crepitation. Rapid and great swelling takes place, if reduction and coaptation are not soon resorted to ; the bloodvessels are torn more and more by the ends of the bone, and effusion of blood into the intermuscular cellular tissue is easy. Very soon more extensive and dangerous swelling takes place, the result of inflammatory action, accompanied with startings of the muscles and greater retraction of the limb.

Fractures of the middle and lower thirds of the bone are not attended with such great risk, and are more manageable in every way. There is less disfiguration—the ends of the bone are not drawn by the

action of the muscles so far apart. The fracture is either oblique or transverse, according to the direction of the force applied ; and the bruising and the degree of swelling are also dependent on the same circumstance. From transverse fracture fissure sometimes extends, separating one or other condyle.

The reparation of injury in the upper part of the femur is opposed by a variety of circumstances. Fractures of the neck of the bone are almost uniformly met with in those whose powers of life have been nearly exhausted. The whole injury is confined within the synovial capsule, and the fibrous tissues which support that are unyielding, and but slightly vascular ; consequently, in fracture of the neck of the femur, there occurs none of the swelling and increased vascularity of the surrounding tissues, which follow fracture of other bones, or other parts of this bone ; from this cause, support of the disunited parts is deficient. The head and neck of the bone are not so well supplied with bloodvessels as the other parts ; those arteries which pass along the ligamentum teres are the chief support. And perhaps the influx of blood is not increased, in consequence of injury, to such a degree as in other parts ; in these, when the surrounding parts are bruised or otherwise injured by fracture in their immediate vicinity, their vascular action is soon excited, the vessels ramifying on the periosteum are enlarged, and blood is poured into the bone at all points. Instead of these salutary changes, the secretion of synovia is increased, and a fluid, perhaps vitiated, surrounds the bone, and is in-

terposed betwixt its ends. There is also difficulty in performing accurate adaptation of the broken ends, and in securing retention so long as is necessary for union; the limb has a tendency to retraction; in readjusting the apparatus, when become loose, the broken surfaces are rubbed on each other, and thus any union which may have been in progress is interfered with. In consequence of all this, union seldom takes place by bone; it has occurred, and will occur, in favourable cases and under good treatment; but it is an undeniable fact, that the circumstances which of a necessity follow fracture at this point are inimical to its effective reparation. The broken ends are sometimes united by fibrous tissue. Most frequently no union takes place, and the broken surfaces gradually become smooth and adapted to each other; a false joint is formed, but at the same time the capsular ligament, and tissues exterior to it, are thickened and strengthened, and so the unnatural motion is limited. The rough and irregular portions of the bone are absorbed, and the neck of the femur, from interstitial absorption, almost disappears; its head lies attached to the cotyloid cavity, and is rubbed upon by the opposed surface of the shaft. Shortening of the limb is an inevitable result, and at first the power of motion is slight, and the support afforded to the body weak; in course of time the member becomes strong and useful.

Many bones are preserved and exhibited, in which fracture of the neck of the thigh-bone, with bony union, is supposed to have taken place; but there are

strong grounds for suspecting that many such have not sustained actual fracture. The neck of the bone may be shortened, and set on awkwardly, and there may be masses of new osseous deposit round the neck and the trochanters. Perhaps the history of the case is known—An old person sustains an injury of the hip by falling, or by a blow on the trochanter; great lameness ensues, and, after a confinement of many weeks, the patient begins to use the member, which, however, remains considerably shortened. But all this may have taken place, and, on examination after death, the parts may have presented the appearances above alluded to without fracture. The change in the bone is the consequence of diseased action induced by the injury. The bloodvessels of the bone and its coverings are excited, and new osseous matter is formed at various points; at the same time, interstitial absorption of the cancellated texture of the neck gradually advances, and the bone is consequently altered in length and form. These appearances alone, therefore, do not warrant the confident belief of fracture having occurred, even though the history should seem to favour the assumption. And it ought to be recollected, that mere bruising of the parts about the hip is not unfrequently attended with inability to move the limb, with eversion of the foot, so as to relax the muscles which have suffered, and sometimes with slight apparent lengthening.

In many patients advanced in life, who have sustained fracture of the neck of the femur, there is

little, if any, chance of union. In these cases, the application of apparatus with the view of adapting and retaining the parts, is productive of great annoyance, and is apt to produce either ulceration or sloughing of the integuments at various parts; and confinement to one constrained position for a considerable time has a mischievous effect on the general health. Instead, the limb is placed in the easiest posture, either extended and slightly retained, or bent over a double inclined plane formed by pillows, with the knee of the affected side fixed to the opposite; a broad band is passed round the trochanters and pelvis, so as to restrain motion without causing inconvenience; and when pain about the thigh is troublesome, fomentation may be used. After some weeks, when the uneasy feelings have subsided, the position is changed, the patient is set up, and encouraged to move about, supporting the weight of the body upon crutches.

In more favourable subjects, whether the fracture is suspected to be without or within the joint, either entirely or partially, the broken surfaces are to be brought in contact, and retained immovably in apposition for a time sufficient to admit of union. The limb is put up in apparatus not requiring removal, and but little re-adjustment. This can be effected only in the extended position. Many splints, with foot-boards, straps, and screws, are intended for this purpose, some to be attached to the injured limb, others to the sound one; but the apparatus which is

most simple, and easily procured at all times and in all circumstances, is at once the best and the most efficient. This is a straight wooden board, not too thick to feel cumbrous, and not too thin to be pliable or easily broken; in breadth corresponding to the dimensions of the limb, in length sufficient to extend from two, three, or four inches beyond the heel to near the axilla; deeply notched at two places at its lower end, and perforated by two holes at the upper. The splint, well padded, is applied to the extended limb, the ankles being protected by proper adjustment of the pads. The apparatus is retained by bandaging. A common roller is applied round the limb, from the toes to near the knee, so as to prevent infiltration, which would otherwise follow pressure above by the rest of the apparatus. The splint is then attached to the limb by involving both in a roller from the foot to above the knee; and in doing this, the bandage, after having been turned round the ankle, should be passed through the notches, so as to be firmly attached to the end of the splint, thereby preventing the foot from shifting. A broad bandage is applied round the pelvis over the groin, and down the thigh, investing all that part of the limb left uncovered by the previous bandaging. A broad band, like a riding belt, is fastened round the pelvis, so as to bind the splint to the trunk, and thereby keep the broken surfaces of the bone in contact. A large handkerchief, or shawl, is brought under the perineum, and its ends secured through the openings at the top of the board. It is evident that,

the splint being thus securely fixed and made as part of the limb, tightening of the perineal band will extend the member, and preserve it of its proper length. By care and attention in applying the apparatus, and in adjusting the cushions about the ankle and perineum, there is little or no risk of the skin giving way. The bandages will require to be re-applied once or twice during the cure, and the perineal band should be tightened frequently. The apparatus is retained for six or eight weeks, the time necessary for union varying according to circumstances. After its removal, great care must be taken at first in moving the limb and in putting weight on it: it should be accustomed to its former functions very gradually.

The same apparatus is the most effectual for all fractures of the thigh; but those near the distal extremity, and in the lower third of the bone, may be managed easily and well on the double inclined plane—M'Intyre's splint, the thigh-piece of which is double, the one portion sliding on the other, and made to shorten and lengthen by means of a screw, without removal from the patient. To this the limb is secured by bandaging from the toes upwards; the upper bandage, which should be broad, being continued close to the perineum, and then passed several times round the loins. By elongating the thigh-piece by means of the screw, extension is kept up. Great complaint is made by the patient of pain and stiffness in the knee for a long time after the treatment of broken thigh in the bent position.

There is no possibility of treating fracture of the

thigh, with any satisfaction or credit, on the outside of the limb with the knee bent ; however attentively the splints are placed, shortening, eversion of the foot, and deformity of the whole limb, are sure to follow. No greater absurdity and cruelty is conceivable than leaving the fracture unadjusted for weeks, making attempts to subdue consequent overaction, and then endeavouring to reduce and retain the bones at a period when otherwise they should have been firmly united. " Experience teacheth" not " fools," and cannot amend those whom prejudice has blinded.

Compound fracture of the thigh, if circumstances do not forbid attempts to save the limb, is to be reduced and retained in the same way as the simple, the wound being attended to, and means taken to subdue inflammatory action. Abscesses must be opened timeously, the limb must be equably supported, and the powers of the system preserved.

The application of force may, in young persons, detach the epiphysis of the lower end of the femur, and displace it to a greater or less extent ; and if the accident be not detected, the epiphysis will become consolidated with the shaft in this unnatural position, impairing the usefulness of the member, and probably laying the foundation for disease in or around the articulation. Reduction is easy, and the retentive treatment is the same as that recommended generally for fracture of the thigh near the knee-joint. I have met with one well marked case of this form of diastasis. A girl sustained an injury of the knee when

fourteen years of age, in consequence of the limb having been entangled amongst the spokes of a carriage-wheel in motion; the knee continued painful and swoln, and she had a halt in walking. After the lapse of about three years, extensive suppuration occurred in the lower part of the thigh and round the knee-joint, and amputation very soon became indispensable for the preservation of life. The synovial apparatus was much diseased, and the epiphysis of the lower end of the femur was found displaced forwards and upwards, so that only the posterior part rested on the tibia; in fact, it was turned almost half round on the shaft: firm union by bone had taken place.

Fracture of the *Patella* is generally simple. It is occasioned either by great force applied to the bone directly, or by the action of the strong extensor muscles—the knee being suddenly bent, and the bone snapped across over the end of the femur. The degree of immediate swelling, and of incited action, will vary according to the mode of infliction. When the injury is caused by a blow upon the part, the bone may be broken either transversely or vertically, or both; either the upper or the lower portion may be vertically split, usually the upper; sometimes there is considerable comminution. Muscular action produces transverse fracture only.

The nature and extent of the injury is readily ascertained. The patient is unable to extend the limb, and cannot support weight on it; in the bent

position, a space is felt in the situation of the patella, the lower portion is found nearly in its place, but the other is drawn upwards on the fore part of the thigh; by extension of the limb and flexure of the thigh the portions are approximated, and crepitus is perceived when they are brought in contact. These symptoms are perceptible through any quantity of bloody effusion. By attentive manipulation, comminution and vertical splitting may also be detected. The circumstances attending the accident will, in most instances, lead to a tolerably accurate expectation of the state of parts.

The ligament of the patella does not give way to muscular action; it is much stronger than the bone, and the latter consequently snaps. It may be, and has been, divided, along with the superimposed integument, by a fall on a sharp substance. This accident is followed by lameness, the ligamentous tissue does not soon unite, and the limb is long in regaining its usefulness; sometimes the union is imperfect, and the member remains weak.

Division of the integuments over a fractured patella is a very serious accident. The joint is opened, and such a state both of the limb and of the constitution must sooner or later occur as to cause necessity for amputation.

The bone unites, under favourable circumstances, in the same way as any other. In longitudinal fracture there is almost always bony union. In transverse, the obstacles to correct apposition are great;

the upper portion is acted on by the muscles on the fore part of the thigh, to a greater or less degree, in almost any position; there is increase and vitiation of the synovial secretion, and when the bones are approximated, this fluid is interposed. The union is therefore almost uniformly ligamentous, and, fortunately, this is as strong and as rapidly effected as that by bone. When the treatment is not of the most approved kind, a long portion of ligament is produced, and the limb remains weak. But union by a short ligament is undoubtedly the most desirable result, the member is as useful as when bone is the uniting medium, and ligament is less subject to disruption; bony union is, for a long time, apt to give way on the application of even slight force.

The fragments are to be approximated, and brought nearly into contact, by placing the limb, with the knee extended, and the thigh slightly bent on the pelvis. The limb is retained in this position by the application of a straight splint behind, hollowed at the extremities, extending from a little below the tuberosity of the ischium to below the middle of the leg, and retained by a roller, not at all tight; the foot and lower part of the limb must be previously bandaged to prevent infiltration. All apparatus with straps, buckles, and apertures to receive the portions of the bone, are worse than useless. The splint requires to be worn for some time after the patient gets into the erect position, which ought not to be before six weeks after the accident.

Fracture may occur at any part of the *leg*. One or both bones may give way, either transversely or obliquely, according to the application of the force. The transverse fracture is produced by a direct blow, by a heavy body striking or falling on the limb, or by the lower part of the limb being fixed whilst the body is in rapid motion; the oblique is caused by force applied in the direction of the bones—as when a person falls or leaps from a height, and alights on one foot, the limb being extended and the body erect. In the latter description of accident, it is frequently supposed, erroneously, that but one bone has given way; fracture of the tibia perhaps is perceived some few inches from the distal end, whilst the fibula at that part is entire; but by attentive manipulation, it will often be found that the fibula has sustained fracture, within a short space of its upper extremity; the force was applied to the ends of the bones, and they gave way, each at the weakest point.

The tibia is broken at its upper part, near the tuberosity, with or without similar injury of the fibula. There is considerable displacement, particularly in the bent position of the knee; there is no restraint to the action of the extensor muscles inserted immediately above the point of fracture, and these, though not acting with unusual power, cause protrusion of the upper end of the tibia, the condyles of the femur serving as a fulcrum over which the muscles are stretched. This injury is usually the result of direct violence.

Fracture of one bone, at a point lower in the limb, is not attended with much displacement or deformity. Indeed, attentive manipulation is often required to detect the site of the injury; and a sense of crepitation is perceived, only when the lower and upper portions of the bone are pressed on alternately or during rotation of the foot. When both bones are broken, the displacement and swelling are great. The foot is sometimes turned inwards, but usually it falls outwards; and if there has been much laceration of the soft parts, with or without division of the integuments, the lower portion of the limb hangs quite loose.

By the application of great force, as by a rope being twisted round and run tight on the limb, both bones and soft parts may be reduced almost to a pulp, without much or any division of the integument. Such an accident is followed by rapid and great swelling, violent incited action, gangrene, and severe constitutional disturbance. The progress of the mortification is not in all cases uniform; in some, the swelling and discoloration extend to the groin and trunk in two or three days, attended with furious delirium; in others, the disorganisation of the limb is very slow, some days elapsing before it reaches the knee, and in these the constitutional symptoms are less severe.

In some cases there is extensive wound of the integuments, without serious injury of the bone, muscles, or vessels. The skin either has been divided by the external force acting upon the resisting bone,

or the sharp fractured end of the bone has been thrust through. Sometimes the bone is protruded to a considerable extent, and entangled amongst the more superficial soft parts.

Fractures of the lower portions of the bones are generally the consequence of twisting and partial displacement of the ankle. The fibula is most frequently broken by twisting of the foot outwards, and the fracture is almost uniformly between two and three inches above the articulation. The broken ends are displaced inwards upon the tibia. The injury is detected by moving the foot, and tracing the line of bone; after swelling has taken place, examination, though almost equally easy, is productive of much more pain, and it is of importance to ascertain the nature of the injury at once, and immediately after the accident. The outer malleolus sometimes gives way from the same cause; or it may be snapped off by a direct blow. The lower portion of the tibia is sometimes longitudinally split by bending inwards of the foot, the patient having fallen from a considerable height; occasionally the inner malleolus is broken transversely. Enquiry as to how the accident happened, particularly as to the direction of the twist, the displacement of the foot, and the degree and extent of crepitation, will determine the nature of the injury.

The astragalus, os calcis, the other bones of the tarsus, and those of the metatarsus, are sometimes broken by the application of great force, but they

are not much displaced. Sometimes the foot is violently concussed in consequence of a fall from a height, and, though no fracture may have occurred, the patient is equally lame and pained; severe inflammation is sure to supervene rapidly, and may terminate untowardly.

Fracture of the upper part of the tibia is to be treated in the straight position, for it has been already observed, that when the knee is bent the upper portion necessarily projects. A hollowed splint of wood, extending from the middle of the thigh to near the heel, is applied behind, whilst one of paste-board is placed on each side: all are secured by bandaging, the foot and lower part of the limb being rolled previously to prevent infiltration; by this simple apparatus motion of the knee-joint, and of the ends of the bones on each other, is completely prevented; the heel is raised, if necessary, for complete adaptation.

Fractures of the middle and lower portions of the bones are treated most advantageously, whether simple or compound, in the bent position, the angle being made more or less obtuse, according to the degree of flexion most conducive to easy reduction and retention. Extension is made on the limb, and the parts brought into as natural and handsome a shape as possible; and in doing so, the appearance of the sound member should be kept in view. There is seldom any difficulty in accomplishing reduction; the extending and counter-extending power need be but

slight ; the upper part of the limb is steadied by an assistant, whilst the lower is stretched and moulded by the hands of the surgeon. In compound fractures at this part, the portions of bone completely detached from the hard and soft parts are to be extracted. And if reduction cannot be effected in consequence of a sharp and long end of the bone projecting through a narrow wound, either the portion must be abridged by the saw or cutting pliers, or the wound must be enlarged. Sometimes the one mode is preferable—sometimes the other—occasionally both are required. When the protruding portion composes but a small portion of the shaft, though perhaps of considerable length, it should be taken away ; but when, on the contrary, it is more thick than long, it is better to enlarge the wound ; but on this subject no general rules can be laid down. The splint is the same as that recommended when treating of fractured thigh, composed of a thigh and leg-piece, with a movable foot-board—the double inclined plane, improved by Mr M'Intyre of Newcastle and others. The foot-board is fixed so as to make the leg-piece of the proper length, and the splint is secured at a convenient angle. It is padded by means of a cushion filled with fine chaff. The foot is rolled separately ; the limb is then raised carefully, and laid down on the splint placed quickly beneath by an assistant ; it is retained in a proper position by the hands of the assistant, whilst a roller is carried from the toes round the foot-board, and along the limb to the knee. A broad roller is then made to surround the thigh and

splint, and having been turned several times round the loins, is secured to the upper part of the cushion. The limb is thus rendered independent of the motions of the trunk; it is made as of a piece with the splint. The wound, if any, is to be approximated. If discharge follow, part of the bandage may be undone from day to day, for the purpose either of employing fomentation or of applying suitable dressing, and still the limb is kept perfectly steady. Abscesses must be opened early—spiculæ removed—constitutional symptoms warded off, and, if they do occur, combated,—at one time inflammatory action must be kept down—at another and more advanced stage, the strength must be supported by all means. In simple fracture it is seldom necessary to undo the bandage, till the apparatus is loosened by subsidence of the swelling—and if the fracture be early reduced, and kept steady, that will be but slight. Then the bandages are undone and reapplied, and the position of the limb attended to. It is seldom necessary to interfere with the leg during readjustment, but should there be any deviation, even considerable, from the proper position, it is easily remedied at the end of the first, second, third, or even of the fourth week; but the sooner the better. The patient may be removed from bed, and may sit up during the greater part of the day, with the heel on a level with the pelvis, within the first week. His health, appetite, and spirits, are thus kept up, sore back is avoided, the tedium of confinement diminished, and the cure greatly accelerated. At the end of five, six,

seven, or eight weeks, according to the age, and as the consolidation advances, the patient may be allowed to move about on crutches, some few days after removal of the apparatus, the foot and leg being still bandaged. No weight should be put on the limb for several weeks after, otherwise a leg cured well and straightly may become bent, twisted, and deformed.

Fractures of the lower extremities of the bones, and of the malleoli, are reduced by placing the foot straight, and retaining it so by the application of a straight wooden splint; the parts are protected by a wedge-shaped pad, and the whole is retained by a common roller. The splint is made to project two inches or two inches and a half beyond the ankle, and to reach near to the knee-joint. It has two perforations in the upper end; to these a bandage is attached by its split end, and it is then carried down along the inside of the splint, and rolled round the foot and ankle; thus the apparatus is prevented from shifting upwards. The other extremity of the bandage, during its convolutions round the foot, is made to pass through notches in the farther end of the splint; the foot is thus turned to the side opposite to that in which it was placed by the accident, and ought to be retained so till consolidation has taken place. The splint is always placed on the side of the limb opposite to the fracture.

Disunited fracture. In some cases union takes place very slowly. On removing the splints, with the expectation of finding the bones firmly united, the

ends can be moved very freely on each other without crepitation or much pain. This, as already stated, may be referrible to various causes—necessary or accidental evacuations, natural or not—diversion of the nutritious fluids to some particular organ, as in pregnancy—the period of life, a diseased state of the bone or of the marrow, &c. By keeping the parts immovable and firmly compressed for some time longer, consolidation may be brought about. But in spite of every care, the ends of the bones in some cases remain unconnected by any save a soft medium. This happens, however, very rarely under proper management. I have had but one case of it in my own practice, when the patient was from the first under my own inspection and care ; and in that the occurrence of false joint was attributable solely to the absurd conduct of the patient. He was tripped up on the street by some individuals following their avocation as pickpockets, fell, and broke his forearm. The fracture was immediately reduced and splints applied—one of pasteboard on each side, with a wooden one exteriorly till the pasteboard hardened. He soon cut away the ends of the splints—within thirty-six hours after they had been put on—so as to allow motion of the fingers and hand, sufficient for indulgence in card playing. The splints were still farther shortened, and wholly removed much too soon ; shortly afterwards he fell from horseback. No union took place by bone. Unless in the case of previous disease of the bone, disunion is generally attributable to some carelessness or recklessness, either of the surgeon or of the patient.

If any osseous deposit has taken place, it is absorbed; the ends of the bone are diminished in size by interstitial absorption; ligamentous or fibro-cartilaginous tissue is formed round the wasted extremities; and the surrounding cellular tissue being thickened and condensed, a sort of synovial pouch is formed, in which the ends, by this time smooth and rounded off, move freely. The limb is shortened in some degree, and its actions are very much diminished in force, there being no sufficient support for the muscles. The bones of the leg and of the forearm are occasionally the seat of false joint, sometimes the femur, but most frequently the humerus.

By the tight application of a firm and broad belt of leather, the part is steadied, and the limb rendered more serviceable. Various measures have been proposed and practised with the view of promoting a salutary increase of action in the parts, by which osseous deposit in sufficient quantity to form a firm uniting medium might be procured. The ends of the bones have been exposed by incision, and removed either by the saw or by cutting pliers; they have then been placed together, retained by proper apparatus, and treated as a case of compound fracture. The ends have been cut down upon, rubbed over with escharotics, as caustic potass, and afterwards treated as in the former method. Setons have been passed between the ends of the bones, and been retained till sufficient action has occurred; they have been then withdrawn, and the limb steadied by splints and bandaging.

To the last method I would, from some experience, give the preference. It is the least severe, both immediately and consecutively; it is the most readily accomplished, and the most likely to be followed by a successful result. The exact site of the ends of the bones must in the first place be ascertained; the position of the bloodvessels and nerves must be looked to, that they may be avoided; a bistoury is then passed through the skin and down into the substance interposed between the ends of the bones. A strong and sharp needle, fixed in a handle, and with its eye near the point, is passed, in the track of the knife, fairly betwixt the bones, and pushed through the soft parts on the opposite side of the limb. A cord is then passed through the eye, and by withdrawal of the needle the seton is properly lodged. The effects must be attentively watched, and when sufficient action is supposed to have been excited, perhaps at the end of the first week, the cord is withdrawn, and the limb placed immovable in a proper position. If action is slow in supervening, the chord may be smeared with irritating substances, as the unguentum oxydi hydrargyri rubri, melões vesicat: &c. In this manner I have treated false joint in several situations successfully, but I have also been sometimes foiled in effecting my purpose. Much will depend on the period at which the practice is adopted.

Dislocations.—Some joints are so contrived—their composing bones are so notched into one another, and connected by such powerful apparatus—and

they are crossed by tendons, and tied together by ligaments in such a manner,—that dislodgement can scarcely be effected but by the most violent means. Nothing short of immense force is sufficient, and the displacement is uniformly attended with fracture of portions of the bones, or of their processes. Other bones are loosely joined, permitting free and unrestrained motion in all or in many directions, and but little force, applied in particular directions, suffices to separate and luxate them. In every joint the processes are liable to be broken, and the attachments of the ligaments to be torn off; ligamentous tissue withstands a greater degree of sudden violence than the osseous. The synovial membrane, and the fibrous tissue exterior to it, are almost always torn in complete luxation; but the extent of laceration varies in different joints, according to the direction of luxation and the degree of displacement. The rent may be small, closely embracing the neck of the bone; or there may be an extensive gap on the side opposite to that on which the luxation has taken place. In an articulation surrounded by muscular substance, there is also laceration of this to a greater or less extent. In some individuals, dislocation is very apt to occur, perhaps from peculiar laxity of fibre; and if in any person luxation of a joint has once been produced, the accident is apt to occur again and again from but slight causes.

In general, the mobility of the luxated joint is much diminished; the limb is either shortened or lengthened; its contour is changed; the injury is

attended with violent pain ; the patient is sick and pale ; the system receives a shock, from which it gradually recovers after some time. Then swelling, from effused blood, takes place ; and this is followed, after some hours, by excited action of the vessels and farther effusion, giving rise to greater stiffness and pain on attempts at motion. If no means are taken to replace the bone, the painful feelings subside along with the swelling, the limb remains long useless, and is the seat of occasional lancinating pains, but at last motion and utility are to a certain extent restored by the formation of a new joint—the head of the bone, and the parts on which it rests, mutually accommodating themselves to each other, by degrees, and permitting a limited extent of motion. Post mortem examination, years after the occurrence of the injury, shows change in the form of the bones—the head is flattened, and in the bone on which it lies there is a corresponding depression, formed partly by the deposition of new matter, partly by absorption of the old ; in dislocation on the dorsum of the ilium for example, there is excavation by absorption opposite to the centre of the head of the femur, and round this new osseous matter is deposited so as to form the cavity into a cup resembling the acetabulum. New processes are formed for the attachment of the muscles, and the old are absorbed to a remarkable extent. There are also new ligaments ; and a sort of capsule is formed by condensation of the surrounding cellular tissue. The new articulating surface becomes quite smooth internally, and is covered, if not by cartilage, by a sub-

stance resembling it very closely ; the old is gradually filled up and obliterated, the prominences being absorbed, and the cavity occupied by new deposit. These changes do not take place so rapidly as is generally supposed ; the cartilage and synovial surface are not much altered for months after the occurrence of luxation ; and if replacement be effected, the functions of the parts are soon performed as before the injury.

In some articulations, on account of the formation of the opposed surfaces, attempts at reduction prove ineffectual after the lapse of two or three weeks ; in others, of more simple construction, it may be accomplished after some months. The simple mode of reduction is to put the patient off his guard, so that the muscles may be in a state of relaxation, and then to move the limb artfully in the proper direction, without much force. Occasionally, the bone is pulled into its place by the action of the muscles, during the patient's efforts to place the limb in a comfortable position. Considerable force, however, is sometimes required in even recent luxations of large joints, and means must also be taken to weaken the muscular power. The patient, if young and robust, may be bled to syncope, or placed in the warm bath till a sense of fainting supervenes ; or an enema of tobacco infusion may be administered, and smoking of tobacco may have the same effect when the patient has not been addicted to the noxious habit ; or antimonial solution may be given in nauseating doses. Several or all of these methods may be necessary in some cases, par-

ticularly if the dislocation be of long standing. When thus general exhaustion has been procured, counter-extension and extension are to be had recourse to. The former consists in having the patient, and the bone next to the trunk, fixed immovably by fitting laques and belts; and the latter is made by one or more assistants, or, if need be, with the help of pulleys. During extension, advantage is in many cases gained by lateral force and by rotation of the limb, the bone being thereby moved from its position, and brought within the sphere of muscular action, by which it is drawn suddenly into its proper place. In some cases, there is no doubt but considerable laceration is occasioned by the efforts at reduction, and perhaps this is in some degree necessary to a successful issue—as when the capsule has been slightly lacerated by the accident, and in consequence interposes an obstacle to the head of the bone slipping into its socket. After reduction, inflammatory action in the articulation and its neighbourhood is to be expected, to a greater or less degree, particularly when much force has been employed, and means must be taken to avert it; local are generally sufficient, along with perfect rest.

In luxation of the *lower jaw*, both articulating ends are most frequently dislodged. They can escape in but one direction, forwards into the temporal fossa; when both are dislodged, the mouth is widely open, and fixedly so, the chin is drawn downwards and backwards. When one is displaced, the jaws are

partially opened, the chin is twisted to a side, and immovable. Great pain is experienced from the pressure of the condyles of the bone on the temporal muscles, from stretching of the fibres of the pterygoids, and from interruption to the functions, by pressure, of the contiguous bloodvessels and nerves. Mastication is impossible, the speech is altered, and indeed articulation may be said to be impracticable.

It is supposed by the vulgar, that the accident is particularly apt to happen to infants and young persons. Nurses are in consequence careful, when a child yawns, to support the chin, and pronounce an accompanying blessing. The articulating cavity is then shallow, yet luxation must be rare in young subjects. In my own experience no instance of dislocated jaw has occurred but in adults; and then, either from over-opening of the jaws, or from powerful muscular action during depression of the inferior maxilla.

The nature of the injury is at once known; and the displacement is easily remedied. But I have met with instances where, through ineffectual attempts at reduction, the unnatural position has been allowed to continue for many hours, to the great distress of the individual. The object in view is to depress the ramus—one or both, as may be—and to raise the chin. This is effected by pressure with the thumbs on or in the situation of the molar teeth, whilst with the fingers the jaw is moved upwards and backwards. The thumbs need not be protected by a glove, as is generally recommended; on the bone re-

suming its place, they are easily slipped into the space betwixt the jaw and the cheek. There is no necessity for bandaging, as retentive apparatus; the patient is not likely to yawn for some time after.

Luxation of the clavicle, at either end, is produced by force applied to the point of the shoulder. It is seldom that the sternal extremity is separated from its connexions. When this accident does happen, it is easily recognised; the end of the bone is prominent and loose, and is distinctly felt riding over the top of the sternum. Replacement is effected by bringing back the shoulder; but the bone is with difficulty retained in the proper position, and is long in becoming fixed; a certain degree of deformity is ever after present.

Displacement of the scapular extremity is by no means rare, and occurs to a greater or less extent, according to the laceration of the ligaments. If those only are torn which connect the end of the bone to the acromion, there is mere rising of the end. But if—as is often the case, when the violence has been great, as in a fall either from a height or with great velocity—the conoid and trapezoid ligaments, connecting the tuberosity of the bone with the coracoid process, have given way, then the end of the bone projects, pushes out the deltoid, and gives rise to considerable flattening of the shoulder. The arm falls forwards, and cannot be moved but with pain; nor is the patient able to raise it by muscular power. If the surgeon grasps the middle of the bone, he finds

the end movable; and the evident and deforming projection puts an end to any doubt regarding the nature of the case. The bone is readily reduced by raising the arm, and carrying the scapula backwards. The limb must be retained in the proper position for many weeks, if a cure without interruption, and with as little deformity as possible, is desired; but after the utmost care and patience, there still remains, in almost every case, some projection more than before the accident. The ligaments are slow in uniting, and the union is imperfect and weak. The requisite apparatus is the same as for fractured clavicle, but must be retained for a longer time. The patient experiences great relief from the limb being put up in this manner and maintained so; and inflammatory action, with much of the swelling, is averted.

The inferior angle of the *Scapula* occasionally escapes from under the border of the latissimus dorsi, usually with some laceration of the muscular fibres. The displacement is occasioned by raising the arm above the head to an unusual extent. The angle of the bone projects considerably, and the muscle is felt playing beneath it, more distinctly during motion of the parts; the movements of the limb are limited and painful. The parts may be brought into their original position by pressing the angle of the scapula towards the ribs, whilst the arm is much raised; and the bone is afterwards confined in its proper place by a broad bandage passed tightly round the chest. The retentive apparatus must be continued for a consider-

able time, and in some cases a cure may be so effected ; but in general the bone soon regains its former unnatural position, and continues to do so, however often and however easily it may be replaced. The parts gradually become accustomed to the change in relative position, and little inconvenience is experienced.

Luxation of the *Shoulder-joint* is prevented, by the arrangement and structure of the parts, from taking place in any direction excepting towards the axilla—downwards into the hollow of the arm pit, downwards and forwards under the lower border of the pectoral muscle. On that side the articulation is not supported, as at its other aspects, either by muscular substance or by processes of bone. The accident is occasioned sometimes, though rarely, by direct violence, as by a blow on the back part of the shoulder ; and of such I have seen a few examples. But in almost every instance, the displacement is caused by force applied to the distal extremity of the humerus ; either immediately, as by falling on the elbow ; or through the forearm, as when a person endeavours to break a fall by stretching out the arm, and falls with the whole weight of the body on the palm. The accident may also result from forcible abduction of the extremity, particularly when the power is applied near the extremity of the limb. There is laceration, to a greater or less extent, of the capsule, and of the muscles immediately investing the fibrous tissue round the articulating cavity. Without disruption, complete luxation

cannot exist—the articulating surfaces cannot be separated, nor can the head of the humerus be altered in position; subluxation, or, in other words, a sprain, may occur in such circumstances, but true luxation cannot.

Bruises of the shoulder, with or without fracture, either of the scapula or of the upper part of the humerus, must not be mistaken for dislocation, for the consequences of such a blunder are fearful. In both descriptions of accident, the appearances of the limb are somewhat similar, and hence the examination requires to be particularly accurate and careful. In both there is flattening of the shoulder, but in fracture there is crepitus, motion to an unnatural extent, though painful, and greater suffering during manipulation; in dislocation no crepitus at all resembling that in fracture can be perceived, the motions of the limb are very limited, and the displaced head of the bone can almost always be felt. The direction of the force too, as already observed when on the subject of fracture, is an important assistant in diagnosis; from falls or blows upon the shoulder we may expect fracture, from falls on the elbow or palm, luxation. In dislocation an indistinct feeling, sometimes amounting to obscure crepitation, is occasionally perceived during rotation of the limb; and this arises from one or more of the tendinous attachments of the muscles having, during their disruption, torn away a portion of their osseous attachment.

Great pain attends on dislocated humerus, from the head of the bone compressing and stretching the axillary plexus; and the interruption to the flow of

the blood produces tingling at the points of the fingers, numbness of the whole limb, and after a time swelling of the hand and forearm. Flattening of the shoulder, and depression under the acromion, are the most prominent marks of displacement having occurred, and are at once apparent. They are more distinctly perceived on comparing the two shoulders; then the acromion on the affected side stands remarkably outwards. The projection is not so apparent when the immediate swelling from effused blood has been fully formed, but the hollow under the acromion can be felt through any quantity of extravasated blood. The arm admits of very little motion, is lengthened, and abducted. The elbow cannot be brought close to the side, and attempts to do so are productive of great suffering. The patient has little or no muscular command over the upper arm. Rotation and elevation of the limb require considerable force, and are practicable only to a very limited extent; during attempts at the former, as already mentioned, obscure crepitus is sometimes perceived. The abduction is most remarkable in the dislocation directly downwards; and in this form of the accident, the fingers easily detect the head of the bone lying in the axilla, deep, yet distinct, particularly during attempted rotation. When the head of the bone lies forward under the pectoralis major, it can be felt, and the prominence occasioned by it can be seen, before swelling has occurred, and after its subsidence. The bone sometimes lodges in an intermediate situation, and then the symptoms peculiar to each form of displacement are mixed. When reduction is not

accomplished, the bloody swelling first occurs to obscure the symptoms ; this may in part subside, but then the inflammatory supervenes ; both after a time disappear, the muscles waste, and then all the signs are very apparent. After some weeks, the motions of the limb become more extensive, not in consequence of the head of the humerus having changed its position, or returned into the glenoid cavity, but from the scapula moving on the ribs more freely, and to a greater extent than usual. At last, but not till after a long period, considerable motion can be effected ; the scapula, where the head of the humerus rests, having furnished an adventitious cavity, to which the latter has adapted itself. But free motion can never be regained, for the movements that are effected are chiefly produced by the action of the muscles of the scapula.

Replacement, even in very recent cases, sometimes is accomplished with difficulty in those whose muscles are fully developed. But in general a successful result will follow simple measures, particularly if the patient is taken unawares—as by rotating the arm with one hand whilst the fingers of the other are placed in the axilla, then suddenly lifting the head of the bone outwards, and at the same time performing abduction—the patient being all along assured that he will not be put to pain, and that there is no intention of attempting reduction. In this manner reduction may often be accomplished by the surgeon and one assistant ; the trunk and scapula being fixed by the assistant either grasping the patient in his arms,

or holding a sheet or towel passed round the body, close to the axilla, whilst the surgeon extends and rotates the extremity, and at the same time lifts the head of the bone from its situation. The rotation is made by using the forearm, bent to a right angle, as a lever; thus considerable power can be exerted on the head of the bone, and the long head of the biceps muscle—the stretching of which, no doubt, affords an obstacle to reduction—is at the same time relaxed. In luxation downwards, there is no more successful method than that by counter-extension with the heel in the axilla, and extension by the surgeon grasping the wrist. The patient is placed recumbent, on a couch or on the floor, and the surgeon, sitting by his side, lodges his heel in the axilla, and with both hands extends the arm; after a short continuance of extension, he performs a sudden and powerful combination of both movements, and so jerks the bone into its natural position. In some recent, and in all old cases, it is necessary to apply considerable force, steadily, and for a long time, so as to tire out the muscles, and dislodge the head of the bone. An assistant effects this by means of pulleys. These are fixed to a laque, applied above the elbow with a clove-hitch, and to a ring fastened either in the wall or to a post; two small iron rings which can be screwed into a beam are useful in private practice, and should always accompany the pulleys. When all is prepared the assistant pulls the end of the rope steadily, and with considerable power, whilst the surgeon rotates the limb, and endeavours to lift the head of the bone, at the same time regulating the degree of extension. The

directing of the degree and continuance of the force is not the least difficult part of the procedure, for, when excessive, there is a risk of the axillary nerves and artery giving way; such accidents have happened, and been accompanied with serious and even fatal consequences; and from laceration of other tissues, the muscular, fibrous, or cellular, fatal inflammation and abscess have resulted. The surgeon is therefore called upon to exercise judgment and discretion—not to continue extension to a pernicious extent, and not to abandon attempts at reduction too soon, leaving his patient disabled for life. For making counter-extension to the extension by pulleys, a broad strong belt is useful, perforated near the middle for transmission of the injured arm; it is passed round the body so as to fix the trunk and scapula, coming under the axilla of the sound side, and being then fastened by means of a hook to a ring in the wall.

Luxations of the shoulder-joint may be, and have been, reduced after the lapse of two or three months; but the difficulty increases, and the chance of success diminishes, in proportion to the time which has elapsed since the date of the accident. And in deciding upon making the attempt, many circumstances are to be weighed and considered—the patient's period of life and his occupations, the state of the parts, the degree of motion that has been acquired, and the treatment, if any, which has been previously followed. Perhaps the most important consideration is regarding the state of the parts, as indicated by the degree of motion. If the movements be to such an

extent as to favour the supposition of the head of the bone having been furnished with a new recipient cavity, to which it has in a great measure accommodated itself, and that the glenoid cavity has, from disuse, become altered, the surgeon can scarcely hope for advantage to his patient from attempts to break up the new articulating apparatus, and re-establish the old. The patient will, most probably, be put to a great deal of pain and some danger, without experiencing improvement to the limb; indeed the motions and power may prove less than before. In old men too, force sufficient for reduction cannot be employed without great risk of laceration of nerves, bloodvessels, and muscles. But if the patient be young, the motions still limited, and the articulation apparently not changed by solid effusion, reduction may be attempted with a fair prospect of success, and without injury. In all such cases, however, the surgeon must watch every step of the proceedings, and have sufficient experience to stop short of inflicting irreparable mischief. No standard can be fixed for the degree of force that is necessary and safe; he may be foiled, even after the most powerful efforts, in a dislocation of two or three weeks' duration; whilst, by the use of but slight force, he may succeed in one of as many months. Much assistance is obtained by the means formerly adverted to as auxiliary, by weakening the muscular energy. Of these, nauseating doses of antimony are most generally employed, and being the most safe, may be recommended to be tried first; and if these fail to produce

the desired effect, the patient may be bled freely, if he be young and robust, more especially since this will assist to avert the inflammatory action likely to follow the violent reduction. Tobacco produces the most complete prostration of muscular power, and may consequently be resorted to in extreme cases; but it ought, if possible, to be avoided, as its use is far from being void of danger. The warm bath cannot always be procured; when at hand, it merits adoption, being both safe and effectual, particularly if combined with antimony or bleeding. The extension should not be commenced till these means have begun to take effect, but every thing should be prepared, so that it may be applied at a moment's warning. After all attempts at reduction, whether successful or not, it is necessary to moderate the inflammation that ensues, by local bleeding and fomentation, combined, if necessary, with nauseating laxatives;—general depletion is seldom required.

Luxation of the Elbow-joint is an extremely common accident, particularly in young persons, before the bony processes have been fully formed. It is produced by wrenches, or by force applied to the farther end of the forearm, the bones neither breaking nor bending. Sometimes, though very rarely, it is caused by direct violence, as in a fall, and then may be combined with fracture of one or both bones of the forearm; but in other circumstances, fracture and luxation can scarcely coexist. In general, both bones of the forearm are displaced backwards,

sometimes a little to the ulnar side. The coronoid process occupies the cavity for the reception of the olecranon, and the head of the radius lodges behind the external condyle, the extremity is shortened, and looks twisted ; it is slightly flexed, and in the middle state between pronation and supination. Unnatural lateral motion can be produced, but flexion is impracticable, the limb cannot be brought quite into the extended state, and rotation is difficult and painful. Swelling soon takes place, and consequently the hollows are filled up, and the processes of the bones obscured. Yet the olecranon and inner condyle can always be recognised and felt, and their relative position ascertained ; the form of the end of the humerus, its hollows, and its prominences, can be distinctly discerned, both before and after the swelling, the soft parts being stretched over the bone ; and by rotating the limb with one hand, whilst the other is placed over the outer and back part of the joint, the situation of the head of the radius is detected. Thus the relations of the bones to one another are discovered ; and this must be done at once, whatever pain may be produced by the examination, for it is a saving of suffering in the end. Yet the nature of this injury would seem difficult of detection—a fact scarcely intelligible by any one who is careful in his manipulations, and who possesses common observation, and a sound knowledge of anatomy. Many cases of unreduced luxation are met with ; I have seen it in both elbows of the same person ; and I have had a dozen of cases, in as many months, of unreduced elbows shown too late for attempts at re-

duction. The frequent occurrence of such blunders is the more lamentable, as it is almost impossible to replace the bones after three or four weeks ; indeed, I have been foiled at the end of two weeks. The parts soon accommodate themselves to their new position, the olecranon process shortens, motion rapidly increases, and the bones get more and more secure in their new relations,—osseous matter being deposited laterally, forming cavities for their lodgement, and new ligamentous matter confining them thereto. After a time, flexion can be made to a right angle ; and the limb becomes tolerably useful. By unsuccessful attempts to restore the natural position, inflammation is excited ; and thus the salutary processes, commenced by nature for reparation of the displacement, are interrupted and delayed ; in young persons such disease of the joint may be produced as will lead to loss of the extremity.

Luxation of the *Radius* alone, backwards on the outer condyle, is sometimes met with ; but this bone is seldom singly displaced far from its original site. A hollow is felt below the end of the humerus, on the outer and fore part, and there is a corresponding prominence behind ; the head of the bone is found unnaturally movable on rotation, and this motion is difficult and painful ; the arm is extended, presenting a twisted appearance, and flexion is very limited. Extension is to be made, along with pronation.

Sometimes the radius is displaced forwards. The coronoid process of the ulna is occasionally broken off ; there is no deformity during flexion of the elbow,

but when the limb is extended, the olecranon is drawn upwards.

In luxation of both bones, reduction is much facilitated by position of the arm. The arm and forearm are extended, and the limb is brought well behind the trunk, so as to relax the triceps; then the surgeon performs extension and counter-extension, pulling the forearm with one hand, whilst he pushes with the other placed on the scapula. If the force thus employed prove insufficient, as it seldom will in recent cases, the patient may be placed on his face, on a couch, and on the limb being brought into the favourable position already noticed, counter-extension may be made by the heel planted against the inferior costa of the scapula, whilst the wrist is pulled with both hands. It is seldom necessary to employ pulleys, excepting in cases of old standing; if so, the only peculiarity in their application to this joint is the direction of the force, backwards. And this I consider to be a very material part of the manipulations, for, by attention to it, I have succeeded after previous failures,—after great force had been applied, causing excoriation and swelling of almost the whole limb. In luxation of the radius, flexion and pronation, combined, if necessary, with extension, will generally effect replacement.

Dislocation at the *Wrist*, is very unfrequent. The articulation is naturally strong, admitting of little motion, the bones being accurately fitted to each other, whilst the retaining ligamentous apparatus is both copious and unyielding; on this account

greater force is required to effect displacement here than at either the elbow or shoulder-joints, and violence applied to the hand usually causes fracture of one or both bones of the forearm, not luxation of their extremities. Luxation, however, sometimes occurs, either from violent twisting, or from falling on the palm of the hand; and the displacement may be either of both bones or of one. In the latter case, it is almost uniformly the radius that suffers; in the former, the luxation is forwards.

Dislocation of the distal extremity of the radius is generally produced by a sudden wrench or twist. The bone is felt loose and prominent, sometimes riding over the upper part of the carpus. The position of the hand is towards pronation, supination cannot be performed, and, on attempting it, great pain is occasioned. Reduction is readily accomplished, by pulling the palm with one hand, whilst with the other the head of the bone is pressed backwards into its situation.

Displacement of both bones is more frequently the result of a fall on the palm, with the hand bent much backwards. In this case there are two projections, so distinct as at once to mark the true nature of the accident, one anteriorly, formed by the ends of the radius and ulna, the other posteriorly by the carpus; above the posterior prominence there is a considerable depression. Here also reduction is easy; it is sufficient to perform simple extension with one hand, whilst with the other the wrist is moulded into its proper form. The after treatment, however, requires attention, for extensive laceration of tendinous and

ligamentous tissue, perhaps combined with fracture of the bony processes to a greater or less extent, must have taken place to admit of displacement ; in consequence violent inflammation is to be expected, and means must be taken to avert it. On account of this laceration, also, mere reduction is not sufficient, retentive apparatus must be applied ; as soon as the limb has been made straight, a pasteboard splint is to be applied on each side, as in fracture of the forearm, and retained with a roller, a wooden splint being placed exteriorly until the pasteboard hardens. This precautionary measure is also necessary to avert re-displacement in dislocation of the radius singly ; in both accidents the apparatus should be retained for at least a fortnight. Afterwards, passive motion, gradually increased and combined with friction, is requisite to prevent stiffness of the joint.

In mere sprain of the wrist, large swelling soon forms anteriorly, from extravasated blood, resembling somewhat projection of the bones, and so leading towards fallacy in diagnosis ; indeed it is not unreasonable to suppose that dislocation here does not occur so frequently as is imagined. Fracture also near the distal extremity of the radius, an accident formerly mentioned as exceedingly common from falls on the hand, is very apt to be mistaken for luxation. On this account, and because in every injury of the wrist the parts are soon obscured by bloody swelling, there is a strong necessity for early and accurate examination.

Subluxation not unfrequently occurs ; in other words, the attachments of the bones of the forearm to

each other are broken up, and their extremities separated to an unnatural distance. The accident is distinctly marked by the deformity, the absence of hard projection, and by the unusual space between the radius and ulna occupied by a soft and yielding swelling. Replacement is accomplished much in the same manner as in complete luxation, the bones being compressed towards each other with one hand, whilst extension is made with the other; afterwards splints must be applied and retained.

Compound luxations of the wrist are occasionally met with, and like compound fractures in this situation, are always troublesome, and often terminate unfavourably. The soft parts are sparing, possessed of little vitality, and much injured by the accident; consequently reparation proceeds very slowly, and is generally superseded by unhealthy and profuse suppuration, perhaps accompanied with more or less sloughing of tendons and integument. If the ends of the bones protrude bare, shattered, and split, they should be removed by means of either the saw or the cutting pliers, previously to attempts at reduction; the wound should then be approximated, and the cure conducted on ordinary principles.

Sometimes a single bone of the *Carpus* is displaced, usually backwards. It is quite loose and movable, and is easily replaced, but in almost every case redispacement occurs, the bone at one time occupying its proper situation, at others forming an inconvenient and unseemly prominence on the back of the wrist, diminished by extension, and increased by flexion of

the joint. The accident, however, is rare. I have never seen simple dislocation of any of the metacarpal bones.

Dislocation of the *Fingers* is produced by force applied to the extremities of the phalanges; the displacement is always backwards, excepting at the middle joint, where the bone of the middle phalanx is sometimes, but very rarely, luxated forwards. The remarkable projection on the back part of the finger marks the nature of the accident, even to the most careless observer. Reduction is accomplished by extension combined with flexion. In the case of the distal phalanges, it may sometimes be necessary to fasten a handkerchief to the tip of the finger, in order to obtain sufficient extending power. After replacement, the application of temporary splints and bandage is prudent. Compound luxations, however carefully treated, almost uniformly come to amputation.

Luxation of the first joint of the *thumb* is rather an uncommon accident, and is not easily managed. The base of the first phalanx is displaced backwards upon the distal extremity of the metacarpal bone, causing a remarkable prominence on the dorsal aspect, and a corresponding depression on the palmar. The thumb is shortened, deformed, and almost immovable; the swelling and pain are severe. This displacement is generally produced by the application of force to the point of the thumb, as in falling on it, or in coming against a resisting body with the thumb straight. The deformity is such as at once to apprise even the most inattentive or inexperienced of

the true nature of the injury ; but the treatment is very difficult and puzzling even in the hands of the best informed surgeons. The base of the bone seems to slip through the lateral ligaments, and remain firmly locked in their embrace ; and these being very strong, and in a state of complete tension, defy all usual attempts at reduction. The end of a silk handkerchief is to be attached to the distal extremity of the displaced phalanx, by means of the clove-hitch ; and with this extension is made, either by the surgeon alone, or by one or more assistants,—frequently several are required. Counter-extension is made by the surgeon or assistant grasping the forearm, or another handkerchief may be passed betwixt the thumb and forefinger for an assistant to pull by. The extending force should be made in a direction towards the palm, and almost uniformly requires to be great and long continued, even in recent cases. The bone may occasionally be jerked into its place by a sudden attempt at flexion of the joint, during steady pulling that has been continued for some time. But cases have occurred in which all attempts have proved ineffectual, and it has been found necessary to divide one of the lateral ligaments. From what has been already stated, the reason why this proceeding should facilitate reduction is sufficiently obvious. I have had recourse to it in but one instance,—one in which difficulty of reduction was not to have been expected. The accident was very recent, not an hour had elapsed ; the patient was an old man, and very drunk ; no resistance to the reductive measures

could have been offered by muscular energy ; yet very powerful force was applied and persevered in without avail. At last the external lateral ligament was divided by the point of a very narrow and fine bistoury, and then replacement was immediate and easy. Some inflammation followed, but was kept within bounds, and the man regained the use of the articulation. In other cases, again, the bone is replaced by the use of but very slight force, provided it be applied, as already stated, in a direction towards the palm of the hand. The last phalanx is equally liable to luxation in the thumb as in the fingers, and has no peculiarity of treatment.

Luxation of the Hip-joint.—The great strength of the ligaments, the depth and fitness of the bony and cartilaginous cavity for the reception of the head of the bone, and the great power of the muscles surrounding the articulation, render dislocation here both difficult and rare. The accident is generally produced by great and sudden force, applied either to the distal end of the femur, or to the farther extremity of the limb, as by falling from a considerable height, by the foot slipping whilst the person is supporting a heavy weight, by falls from or with a horse, &c. The luxation, in a great majority of cases, takes place upwards and backwards, the head of the bone lying on the dorsum of the ilium. The limb is shortened to the extent of from an inch and a half to two inches and a half, the toes are turned in, the thigh is slightly bent upon the pelvis, and very

firmly fixed. Before swelling has occurred, and also after it has subsided, the head of the bone can be felt lying under the gluteus. The trochanter is evidently out of place, being depressed, and lying farther up and back than usual. This is strikingly observable on comparing the injured limb with the opposite. Attempts to move the limb and effect rotation produce great pain. Large swelling soon follows, along with greater stiffness and immobility. If the head of the bone is not replaced, the pain gradually subsides, and, after some months, freedom of motion is regained to a slight extent ; the patient is able to walk, but with a great halt.

At first, reduction is accomplished with no great difficulty. Within a very short time after the occurrence of the injury, before the patient had recovered from the shock, whilst he still lay sick, faint, and powerless, I have succeeded in effecting reduction of the femur quite unassisted,—extending with one hand, grasping the thigh behind, and, at the same time, rotating it outwards by pressure of the forearm on the leg, counter-extension being made by the left hand on the symphysis pubis. When a few hours have intervened, assistance and apparatus are requisite. The patient is secured by a broad band,—a common sheet suits very well,—passed under the perineum. The laque is fixed above the knee, with a knot that will not run, a towel wrung out of cold water being applied next to the skin, in order to increase the security of the hold and prevent excoriation. A well-padded broad iron ring, tightened on

the limb by a screw, and provided with suitable straps for attachment of the pulleys, is very useful,—fully more convenient than the common woollen laque. Extension may be made by one or more assistants ; but this may prove ineffectual, and it is better at once to have recourse to the pulleys : these are not alarming to the patient, and, being efficient, will in the end materially diminish his suffering. The extension should be gradual, steady, and persevering ; the rotation of the limb during extension should be principally outwards, effected by laying hold of the ankle, and using the leg as a lever. This motion is peculiarly successful when the bone has yielded a little to the extension, when it has changed its place, and come nearly on a line with the cotyloid cavity. In some cases, even of no long standing, auxiliary means are required,—bleeding, antimony, &c. as formerly noticed. In old cases, no attempts at reduction should be made until the patient has been brought into a relaxed state, approaching to collapse, by one or more of the auxiliary means, and by such as are best suited to the particular circumstances of the case ; in such instances also the extension, rotation, &c. must be persevered in for some time,—they are not at once successful. Frequently, particularly in recent cases, reduction is accompanied and indicated by an audible and perceptible snap, occasioned by the head of the bone slipping into the cotyloid cavity ; the motions are again readily performed, and the limb resumes its proper length and shape. The muscular and articulating apparatus must be kept quiet for some time

afterwards ; a band should be passed round the knees, and the patient strictly confined to the recumbent posture ; at the same time, fomentations are to be used about the joint, to the perineum, and to the part where the laque was applied. It is rarely necessary to have recourse to abstraction of blood from the neighbourhood of the articulation.

There is no great risk of the bone again escaping from its situation. I have but once witnessed such an accident. A female suffered luxation of the hip nearly a month previously to her admission into the Royal Infirmary, and reduction was unavoidably deferred for three days more. It was accomplished without difficulty, and the usual precautions were afterwards adopted ; but next day it was discovered that luxation had again taken place. The patient had cunningly contrived to have ardent spirits brought to her, had indulged freely in these, got out of bed, and slipped down. Replacement was again effected, more easily than before ; the limbs were firmly secured to each other, confinement to bed and no more indulgence were strictly enjoined, and after thirteen or fourteen days the limb fully regained its functions.

Luxation of the hip downwards and forwards, the head of the femur lying in the thyroid foramen, is generally produced by a fall under a heavy load, the thigh being at the same time forcibly abducted. I have seen it occasioned by a fall with a restive horse. The limb is elongated considerably, and advanced a little forwards ; the trochanter major is depressed,

the toes are inclined neither outwards nor inwards ; the limb is immovably fixed, and this the most unequivocally marks the nature of the accident.

The limb is lengthened when the trochanter major is split off, as also when severe bruise of the glutei has been inflicted without breach of continuity in any part of the bone, and without displacement. In the first stage of morbus coxarius too, a somewhat similar appearance and position of the limb is presented ; there is lengthening, but then there is also more or less wasting of the muscles, more mobility than in the dislocation, and a marked history attached. Complicated cases occasionally occur—as when a patient who has been labouring under hip-joint disease, perhaps not in an aggravated form, falls heavily, and on being lifted up is found to be incapable of moving the joint, the limb at the same time being elongated, and having a distorted appearance. An instance of this nature impressed strongly upon me the great necessity for accurate diagnosis in the first instance, and that such was to be acquired only by taking every circumstance into consideration. A young man was engaged in cleaning a slaughter-house, standing on two blocks of wood with his legs considerably apart. One of the blocks suddenly slipped from under him, and he fell with his limbs spread. He was carried home in great pain, and next day I was asked to visit him. The limb was elongated, and the hip flattened, the joint was stiff, and attempts at motion produced great pain ; but by perseverance the limb could be put in various positions, and the

trochanter was not so much depressed as in luxation downwards. By cross-examination it was discovered that the patient had halted in walking for many weeks previously, had felt as if the limb was longer than the other, had pain in the groin and knee; in fact, morbus coxarius had been advancing, and the pain, immobility, and greater elongation had been occasioned by the fall, causing violent excitement of the morbid action previously in progress. Dreadful consequences must have resulted from mistake in diagnosis and practice founded upon it. I have observed, in other cases, great and rapid elongation of the limb in consequence of injury to the hip-joint previously diseased.

The reduction is in many cases difficult. In young and muscular individuals, after the lapse of some hours, when reaction has occurred, the muscles are rigidly contracted, and the head of the bone is not easily dislodged. Extension, made to a certain extent and continued, is not so useful or essential here as in other forms of luxation of this joint. Adduction, carrying the injured thigh quickly and forcibly over the other, is generally successful; and the reduction is favoured by at the same time raising up the neck of the bone, by means of a towel or wooden roller passed under the upper part of the thigh. There is also no such advantage from rotating the bone as in other luxations. It is very often necessary, even in recent cases, to adopt measures to weaken muscular exertions; and again, in cases of three weeks' duration, I have found no difficulty.

The head of the bone, when dislodged from the foramen obturatorium, may slip past the cotyloid cavity, for it is impossible to regulate its direction ; it comes to be acted upon by muscles which have been displaced, some being compressed and partially paralysed, whilst others are excited ; they have been put out of their usual condition and relation, and act irregularly. The head of the bone may, from this cause, get into the sacro-ischiatic notch. This has occurred to me ; but I have found no difficulty in removing it from thence, and effecting reduction satisfactorily.

Displacement into the sacro-ischiatic notch is attended with great and remarkable inversion of the toes, slight shortening of the limb, and prominence of the head of the bone felt under the gluteus maximus. It is the least common form of luxation. Reduction is attempted by extension and rotation outwards, at the same time pulling the head of the bone towards the acetabulum by means of a towel passed under the thigh.

Luxation of the head of the femur on the pubes is perhaps more frequent than any other, excepting that on the dorsum of the ilium. The limb is not much shortened, the toes are everted, the trochanter major is depressed and nearer to the anterior superior spinous process of the ilium than usually, and the head of the bone is both seen and felt prominent in the groin. Much pain, swelling, and sometimes more or less paralysis of the limb, are occasioned by this displacement ; the femoral artery and vein lie immediately

interior to the head of the bone, and are compressed, and the crural nerves are stretched over it. In attempting reduction, rotation inwards should be employed during extension, accompanied with endeavours to lift the upper part of the bone towards the acetabulum.

Luxation of the Bones of the Leg—separation of them from the end of the femur—seldom occurs. It can be the effect only of great violence and great laceration. Most frequently fracture is concomitant, perhaps with wound; and such accidents require amputation, either primarily or secondarily. Subluxation, from laceration of the internal lateral ligament, is not so unfrequent. It is most common in females, the natural conformation of their thigh-bones being to bend inwards; and from falling awkwardly, particularly if carrying a weight, the ligament is apt to give way. The limb is pained, deformed, and unable to support the body, and swelling to a considerable extent soon follows. Reduction is extremely easy; and the parts are retained in site by the application of a wooden splint, to either the outer or the posterior side of the joint, the leg and foot being previously bandaged. The joint remains long weak, and never recovers entirely; a sustaining apparatus, fitted on the outside, retained by straps, and with a joint opposite to the articulation, is required to be constantly worn when the patient wishes to use the limb.

Luxation of the Patella is spoken of by some as common. Others of much experience have not met

with a single instance of it. I have never seen this accident. The bone, it is said, may be displaced outwards, inwards, or upwards. The first form of luxation is the most frequent, and is caused by a severe fall with the foot twisted outwards and the knee inwards. Displacement inwards is produced by direct violence applied to the outer part of the bone, or by the foot being turned inwards in a fall. Displacement upwards can occur only after laceration of the ligamentum patellæ, the bone being then drawn up by the unresisted action of the muscles on the fore part of the thigh. In dislocation outwards, the bone has been found "resting with its inner edge upon the outer surface of the condyle, the fore part facing obliquely forwards and inwards." In this last form of accident, sudden, forcible, and complete flexion of the limb is said to produce immediate reduction. In dislocation outwards or inwards, the muscles are to be relaxed by raising the heel, extending the limb, flexing the thigh, and then forcing the bone to its proper site by manipulation. In the dislocation upwards with rupture, the limb is to be kept extended and raised, and the bone is brought as nearly into its place as possible by bandaging. When a peculiar laxity of the apparatus about the joint exists, whether as a cause of luxation or not, the support of a well-made knee-cap is required.

As formerly stated, *dislocation of the Ankle* cannot take place inwards or outwards, without fracture of the end of the tibia or of the fibula, either above the articulation, or where they project by the sides of the

astragalus for the greater security and strength of the joint. Subluxation, however, or sprain, may occur without injury of the bones : in this accident, should the parts not have spontaneously resumed their original situation, no difficulty is experienced in putting them to rights ; simple manipulation is sufficient. Occasionally, the foot is luxated forwards, by force applied either to the heel or to the fore part of the leg whilst the limb is fixed. The heel is shortened, the foot elongated ; indeed the marks of the injury are so distinct, that comparison of the limbs is sufficient for diagnosis. Luxation may also take place backwards ; and in this case the heel is elongated and the foot shortened. In these accidents it is not unfrequently found that one or other malleolus has given way. Reduction is sometimes difficult. Extension is to be made by grasping the foot and pulling whilst the limb is fixed, at the same time making pressure either backwards or forwards, as may be required. To retain the bones in their proper situations, it is always necessary, at least prudent, to apply a pasteboard splint to each side of the limb, particularly when fracture of the malleoli is conjoined.

Displacement of the Bones of the Tarsus may result from great force ; for example, when the foot is squeezed under a heavy weight, one or more bones may escape from their connexions, and project. Reduction of such displacement is exceedingly difficult at any period, and becomes almost impossible when inflammatory action is allowed to supervene previously to attempts being made. The astragalus is

sometimes pushed out of its place ; though it is difficult to conceive how, to a bone so hid and so firmly connected, such force should be applied as to cause protrusion of it from its natural situation. It has been found lying on the dorsum of the foot, causing swelling, lameness, great pain, shortening and deformity of the limb ; and the shape of the bone can, in such circumstances, be distinctly felt through the integument. As already observed, reduction is almost impracticable, and, with the view of remedying deformity, it has been proposed to cut out the displaced bone ; but as to the expediency of such practice I can give no opinion.

I have seen but one instance of displacement of this bone backwards, and most probably another will never occur to me. A heavy young man, in a state of utter intoxication, fell backwards down a stair, and in the fall his foot became entangled in the railing. The astragalus was found lying betwixt the back of the tibia and the tendo Achillis, its upper articulating surface facing forwards, the lower in contact with the tendon. All attempts to reduce the bone proved fruitless. Violent inflammatory action followed, but was reduced by active measures ; and the limb ultimately became very useful ; in fact, though not till after many months, little lameness or shortening was perceptible.

By *Sprain* is understood subluxation or partial displacement of a joint, with stretching, and more or less laceration of the articulating apparatus—ligaments, tendons, sheaths, and bursæ, being all involved

in the injury. Sometimes small portions of the processes of bone are separated, being torn away, attached to ligament or tendon. All joints, both large and small, are liable to the accident. In the proximal, or in the middle joints of the finger, for example, one or other lateral ligament is stretched or torn; the finger is twisted to a side; the joint is swelled; and this swelling, with pain, is of long continuance, perhaps increased by repeated twists, or by imprudent use of the joint. The elbow and shoulder are frequently sprained, as also the hip and knee; but the injury most frequently occurs in the wrist and ankle. It is generally occasioned by a fall, the foot or hand coming awkwardly to the ground, the muscles being at the time relaxed and unprepared; by over-exertion in lifting heavy weights; by entanglement and twisting of the limb, &c. The ankle is often sprained by what is called a false step; the fore part of the foot comes in contact with an obstacle unexpectedly, the foot is twisted under the limb, the weight of the body is thrown on the apparatus of one side of the joint, and this is in consequence immoderately and unnaturally stretched. Violent pain immediately occurs, and the patient is sick and faint. Discoloration and rapid swelling take place from extravasation of blood into the cellular tissue, into the sheaths of the tendons, and perhaps into the synovial pouches, in consequence of laceration of the bloodvessels. Effusion of serum and increased secretion of synovia afterwards occur, from incited action of the vessels. Thus the joint is deformed. Atten-

tive examination is required to guard against mistakes ; the existence or non-existence either of displacement or of fracture must be at once ascertained by determined and perfect manipulation ; the parts must be pressed and moved, to such an extent as is necessary, notwithstanding the pain thereby occasioned, and notwithstanding the resistance afforded by the patient. It has been already stated that luxation of the wrist is not uncommon ; that separation of the one bone of the forearm from the other, and fracture of the radius, at the distal extremity, are accidents by no means rare. Great disfiguration follows simple sprain, much swelling taking place on the fore part of the limb from effusion under the fascia, and there is also much serous and bloody infiltration of the cellular tissue on the back of the hand and forearm. In the ankle, the ends of the bones must be carefully examined, and also the fibula in its whole extent, that the existence or non-existence of fracture may be ascertained, and that the surgeon may be guided to a correct mode of treatment. If the joint is not put at rest immediately, the extravasation is increased, and, in consequence, the pain and inflammatory swelling also ; and parts of the joint at first not involved in the injury may thus be made to suffer. Many diseases of synovial membrane and articulating cartilages are attributable, and can be traced, to badly managed sprains ; and in some constitutions, but slight injury, combined with a little bad treatment, suffices to destroy a joint. When the case is well managed, the pain is never great, and

soon abates ; the swelling after a few days slackens ; the discoloration becomes greater, the serum being absorbed, and the effused blood shining through the skin ; the integuments appear green, blue, red, purple —these hues either being present all at the same time, or occurring successively ; the discoloration often extends far from the joint. The mobility and strength of the joint are recovered gradually.

Perhaps no injury is more frequently mismanaged, by those both in and out of the profession. Every old woman thinks she can manage a sprain ; most absurd and hurtful measures are resorted to ; the injured parts are kept in motion ; cold lotions and cold affusions are employed, and at the same time stimulating frictions : probably attempts are made, either by leeching or by puncturing, to extract the effused blood ; and many similar follies are committed. The proper treatment certainly appears to consist principally in absolute rest. If there is any displacement it must be rectified immediately. If there is any fracture ; or if there is a tendency to redisplacement after reduction ; or if the patient is restless either from folly or from insensibility, as when the head has been injured by the accident, when the patient is under the influence of strong liquors, or when he labours under delirium tremens, —a splint or splints must be applied to secure immobility of the parts, at the same time without such compression as may interfere with swelling from effusion ; the effusion is a salutary process, and should be encouraged, not repressed. By absolute rest, the

extent of the swelling is limited, and inflammation warded off. Fomentations, properly employed, afford much relief; at first they probably encourage the serous effusion. The integuments soon become relaxed, during the regular use of fomentation, and tension and vascular action subside, as also pain. The swelling then abates, and is no longer hard; it pits on pressure, and the skin has a puckered appearance. Then gentle friction becomes advantageous, and uniform support should be afforded by the application of a flannel roller. The longer the limb is disused, the more perfect and rapid is the recovery, provided the rest of the cure be properly conducted. In general nothing more than what has been stated is required. But if the limb be moved, or stimulated in any way, early, then necessity will arise for antiphlogistic measures—perhaps venesection, certainly copious and repeated abstraction of blood by leeches, accompanied with fomentations, and the internal exhibition of antimonials, purgatives, &c. When such is the case the cure is tedious, the joint long remains swelled and stiff, the patient is lame and incapable of exertion.

Leeching or puncturing at an early period, with the view of allowing extravasated blood to escape, is useless and hurtful. The effused and coagulated blood cannot escape, and suppuration, followed by destruction of the cellular tissue, has often been the consequence of such ill-advised proceedings. Friction with stimulating liniments, or even simple friction, at an early period, is also hurtful, as tending to

excite vascular action, and to convert simple swelling into inflammatory. The application of cold at any period is of little use, and ought certainly to be avoided immediately after the injury, as adding to the sufferings of the patient, and interfering with the natural processes which have commenced for the reparation of that injury.

In limbs that have remained stiff after severe and mismanaged sprain, the dashing of water, either cold or tepid, has been strongly recommended. The practice is not ineffectual; the vessels of the surface are excited, perhaps as by other friction, and perhaps by the reaction which follows the chill. But the limb is apt to become rheumatic; and, on this account, the state of matters will not be improved by this proceeding, unless it be resorted to with proper precautions.

In severe sprains there is reason to think that sometimes even the tendons yield a little—that many of the fibres give way, and that thus the tendon is thinned and elongated. Such injury happens often in horses, in what is called breaking down. In them the tendon is occasionally snapped entirely through, and the ends widely separated. The same occurs in the human subject. Separation of the muscular fibres, however, is rare; laceration of the tendon itself, or separation of the tendon from the muscle, is more common. The yielding of the broad tendons on the upper and fore, lateral and under parts of the abdomen, affords an example of laceration of tendinous fibre from violent exertion. The tendons of the limbs

are more frequently injured, and in the lower oftener than in the upper. I have seen the tendon of the biceps torn in violent exertion. In the thigh, too, some fibres occasionally give way from a similar cause. The supra-muscular fascia in the arm and thigh is apt to give way at one or more points during powerful exertion of the muscles, causing deformity by protrusion of muscle through the torn space. But it is in the apparatus for extending the foot, and raising the weight of the body, that laceration of tendon most frequently takes place. The accident is uncommon till after the middle period of life, when the body has become heavier, when muscular exertions have been less habitually practised, and when the fibre has grown more rigid. The person in raising himself over some slight obstruction in walking, perhaps attempting to pass a small ditch or stile, suddenly "breaks down." Or in dancing,—an amusement which he has long discontinued—a sudden snap is felt, with immediate lameness and slight pain in the back of the limb; swelling and discoloration follow; and these symptoms vary in intensity according to the extent of the injury. Laceration may have been slight; the pain, swelling, and lameness are proportional, and at first an inconsiderable void can be felt at the upper part of the tendinous termination of the gastrocnemii. Sometimes no change is perceptible, and in such cases some have been of opinion that the slender tendon of the plantaris has given way and caused the lameness; but this is doubtful, and it seems more probable that stretching and yielding has taken place in some part

of the tendon of the gastrocnemii, which had been in powerful action—probably, the tendinous and muscular tissues have been separated to a slight extent. Occasionally the tendo Achillis is found completely torn through, and its upper end retracted; in such cases a large space is occasioned at the injured part, when the knee is extended and the foot bent. Sometimes the tendo Achillis is cut through; I have seen both completely divided in the same individual—he received a sabre wound across the back of both limbs, while endeavouring to escape from the mate of a vessel, in which he had been stealing. In rupture without breach of surface, the torn bloodvessels pour out their contents into the cellular tissue to a considerable extent, and if a proper mode of cure be not adopted immediately, inflammation quickly supervenes; and this is apt to terminate very unfavourably in the infiltrated tissue.

The tendon is united by the deposition of new matter, and the conversion of this into substance resembling the original structure from the vessels of which the deposit has taken place. The quantity of new formation necessarily depends on the extent of laceration and the space thereby occasioned. That such reparation of tendon does take place, and that to a very great extent occasionally, is placed beyond all doubt by the results of veterinary practice. “Knuckling over” in horses is occasioned by contraction of the flexor tendon; the heel does not reach the ground, and in order to effect this the tendon is completely divided. The cut ends immediately separate, to the extent of some inches, and after a time

this large space is filled up by a substance similar to tendon, so similar, indeed, that on post mortem examination, some years afterwards, a careless observer could scarcely distinguish any difference in the appearance of the various portions of the tendon.

The treatment of lacerated tendon consists in placing the parts so as to relax the muscles whose tendons have suffered. In rupture of the tendo Achillis, the knee should be bent and the foot extended, relaxing the muscle and approximating the separated ends. This is readily and conveniently effected by placing a slipper on the foot, and attaching to its heel a firm band, which is then fastened to a ring or strap placed on the thigh. This apparatus must be worn for six or eight weeks. Afterwards a high-heeled shoe should be worn for some time; or if the union be still weak and imperfect, a splint may be placed on the fore part, resting on the dorsum of the foot and the fore part of the leg.

Bruise. The effects of bruises or contusions are, separation of the cellular connexions, rupture of bloodvessels, and effusion of their contents into the cells; a cavity, often large, is thus formed partly by the direct injury, and partly by the subsequent effusion, and it is quickly filled with blood, partly fluid and partly coagulated. Immediate tumour forms; and the integument is discoloured, often beyond the principal swelling. The injury may, or may not, be attended with division of the integuments, or with fracture or displacement of the bones; but all injuries of the hard parts are attended with more or less

bruising of the soft Bruise is most frequently produced by a blow, and is most severe when the violence is resisted by an unyielding part, as by bone; a squeeze between two bodies, particularly if they be in motion, also inflicts extensive contusion. The swelling continues to increase for some time, and then gradually disappears along with the pain. As the tumour subsides, the discoloration increases; the thinner parts of the effusion have been absorbed, and the clot then shines through the skin, imparting to it various hues.

Bruise may be followed by inflammatory action. Then effusion is increased, bloody fluid is poured both into the cavity and into the unbroken cellular tissue, the whole parts become extremely tender, the surface inflames, and the excited action is apt to terminate unfavourably in the various tissues. Not unfrequently sloughing takes place, both of the skin and of the cellular tissue and fatty matter, with unhealthy suppuration and infiltration; and constitutional disturbance accompanies. All this is likely, nay, certain, to follow admission of air into the cavity filled with effused blood, whether by accidental wound or by intentional division of the integument. Meddlesome surgery is unfortunate here, as well as in many other cases. After scarifications, punctures, leechings, or incisions, the blood often seems to undergo a putrefactive process, and unhealthy suppuration is quickly established.

Sometimes the clot is not entirely absorbed, and considerable swelling remains for a long time, perhaps with slight tenderness of the part; and foundation is

thus laid for abscess, either chronic or acute. Frequently the inflammatory action following on bruise is not so violent and rapid as that above described, but is limited in its consequences chiefly to the effusion of coagulable lymph. This may not be altogether absorbed along with the other effusion, it may become organised, and be the nucleus or germ of a new growth, of a tumour contrary to nature—deposit increases in and around the nucleus, and this formation, though at first of a simple nature, may become rapid in its growth, and may assume a troublesome or even a malignant action; and sometimes all this may occur at an early period, before the attention either of the patient or of the practitioner has been drawn to the action or to its effects. Many tumours can be traced to the effects of a bruise.

In the treatment of bruise, the parts should be placed in a state of absolute rest, and methodically fomented. Local bleeding is seldom required, and is of little use; at first it is hurtful. When, from the extent or number of the bruises, fever follows, general antiphlogistic measures must be resorted to. Cold and astringent applications, and other repercussives, as also stimulants, are pernicious in the first stage, and are not very useful at any time. Opening of the cavity must be carefully avoided, excepting when absorption has ceased, when the tumour has increased and become painful, and when the effused blood is putrescent, and unhealthy suppuration has commenced. Then the cavity should be opened freely, and by poulticing the clots and sloughs are got quit of; afterwards the parts must be supported, as also the

strength of the patient. When from long want of use, in tedious cases, the parts have become cold, shrunk, and weak, as also happens in sprain, friction, champooing, tepid affusion, passive motion, and voluntary motion short of giving pain, will all be of use as tending to restore the circulation, the nervous energy, and the muscular developement. If œdema remain, bandaging or a laced support will be required.

Amputation. Every endeavour, which skill and experience can suggest, must be made before mutilation of the body, by the removal of even the smallest portion of one of its members, is resorted to. But there are cases in which mutilation, though a harsh remedy, is still indispensable for the saving of life. There are others in which it is prudent and proper to resort to operation, in consequence of a member being perfectly useless, and likely to impair the usefulness of the individual. Such are very bad and complicated fractures and luxations—laceration of the soft parts of a limb to such an extent as to impress the experienced surgeon with a certainty that in a short time gangrene must ensue, and render the success of any attempt to save life very problematical. When the extent of injury is such that, though gangrene may not be dreaded, yet it is plain that extensive suppurations and exfoliations must necessarily take place, a question may arise as to whether immediate amputation is to be performed or not. This will be decided by the circumstances in

which the patient is placed, and often also by his own feelings upon the subject. He may choose to run some risk, and endure much suffering, with even a very slight chance of ultimately preserving his limb. In cases of traumatic gangrene of the chronic form, amputation is not only justifiable but imperative; as also, in those cases of severe fracture, in which the patient is sinking under profuse discharge, with disunited bones. And the same absolute necessity for operation exists in many diseased joints, and in some diseased bones, when the patient's safety would otherwise be endangered, or when, on mature consideration, it is evident that the member, if retained, must for ever be an encumbrance, and worse than useless. Certain tumours of bones, tumours involving joints, tumours and ulcers of the soft parts of a malignant nature, and without appreciable disease of the lymphatic system, will also demand recourse to the amputating knife. Patients, too, will be met with who, after undergoing all the suffering attendant on disease of long duration—as exfoliation and sloughing of tendons, following deep suppuration—will, to get rid of the annoyance of the stiff and deformed member, or part of a member, not only submit to, but urge and insist on, the removal of the offending part. Amputation will also occasionally be required for badly-formed stumps, as those in which the end of the bone protrudes through ulcer of the integument, and is necrosed—or those in which the bone has been sawn of an inconvenient length.

Many precautions are to be observed in this operation. It is not to be commenced without due consideration as to the position of the operator, and of his assistants—their several duties—the form of incision—the length of the stump—the difficulties, if any, which may be expected, and the best means of obviating them. The most prominent objects are, to save undue effusion of blood, to effect the incisions with as little suffering to the patient as possible, and to make them of such a form as to cover the end of the bone effectually—so that pressure may after a time be borne without risk of ulceration of the soft parts, or exfoliation of the bone.

In all cases, and in all situations and circumstances, hæmorrhage can be restrained during completion of the incisions, and during the employment of means to close the cut ends of the vessels, by means of very slight but exact pressure on the trunk of the principal vessel. The point at which this is to be applied, should be at as short a distance as possible above the place of incision, and at the same time above the origin of any branches which must be cut. Not the slightest pressure should be made until the instant when the incisions are about to be commenced, so that no venous congestion may take place in the limb. All the blood in the limb, below the incisions, must necessarily be lost. The veins are more easily compressed than the arteries, and pressure, made a short time before the operation, may arrest the return of the blood, whilst it may not stop its influx ; thus engorgement of the lower part of the

limb is produced, and the quantity of blood that must be lost is increased. For a similar reason, pressure, sufficiently firm to stop arterial hæmorrhage, is to be continued till the principal branches are tied, and then entirely removed; for the continuance of even slight pressure will increase the flow from the surface of the stump—blood, flowing in, and being arrested in its venous return, trickles out through the open ends of the veins. If a circular band be used for the compression, such as the screw tourniquet, it should be put on quickly, and screwed up at once, and then the incisions should not be delayed one instant after; there should be no relaxation of the pressure at any part of the operation; and as soon as the principal vessels have been secured, the apparatus should be altogether removed—otherwise, as already stated, rapid oozing will continue from the face of the stump. It is my confirmed opinion, that much more blood is lost from the use of a tourniquet than without it. I would rather trust to a no very efficient assistant, than put on a tourniquet. It is evident, that compression on the whole circumference of a limb must completely interrupt venous return, and cause the increase of hæmorrhage already mentioned; whereas pressure on only two points of the same circumference, as is effected by the hand of an assistant, is not liable to this objection. Besides, the latter mode is more quickly applied, and more quickly removed, causes infinitely less pain to the patient, and is equally effectual in arresting the flow in the main arterial trunk. The incisions should

always be made rapidly ; and after their completion, the surgeon, if distrustful of his assistant, may himself grasp the limb and compress the vessel, giving the forceps or ligatures to another.

The first step in the operation is to arrange the measures for temporary arrestment of the bleeding. The patient is placed in a favourable position, either sitting or lying, as may be most convenient for the particular amputation, and is firmly secured by one or more assistants ; all the apparatus must be in good order and conveniently placed, and an assistant should be stationed to attend to them, and hand those required. The compressor and the operator are each at their post, and ready to act in concert. The incisions may be made either from without inwards, or from within outwards, after transfixion of the limb. The latter mode is to be preferred when practicable, as requiring less pressure ; the parts are more stretched than in the former method, are therefore more easily and rapidly cut, and consequently less pain is inflicted. To the inexperienced transfixion may appear cruel, it may appal them, but in reality it is almost unattended with pain ; it is rapidly executed, and renders the operator capable of completing his work with great quickness and little suffering, and at the same time with neatness and precision. The knife should be of a size and length proportioned to the incisions, straight-backed, and with a good point ; of a form to pass through readily, yet strong, and not too broad. With one sweep of this the incisions are made at once, through the

muscles, through the cellular and fatty tissues, and through the integuments—or *vice versá*, if the mode from without inwards be preferred. By these parts being cut rapidly and at once, their connexions with each other are not separated, the cut surface is smooth, and the parts are in the most favourable state for becoming agglutinated and consolidated; the bone is more deeply covered, and the stump of a handsomer and more useful shape, than when the parts are cut successively and with detachment.

The operator places himself so that he may grasp the part to be removed, during the sawing of the bone, without change of position. The incisions are made with the left hand free; but as soon as the saw is in the right, the left should take firm hold of the limb below the wound. During the operation, the limb is supported by an assistant, either sitting or kneeling before the patient; but the regulating of the position of the limb, during sawing, is not to be intrusted to him. He may, from anxiety to facilitate the action of the saw, snap the bone and splinter it; or, from dread of this, he may lock the instrument, and so delay completion of the operation. The management of the lower part of the limb should always be by the person using the saw. This instrument should have its teeth well set, and be provided with a workman-like handle. It is worked steadily and not hurriedly, with very slight pressure, and that pressure employed only when pushing forwards. Before its application, all the soft parts must necessarily be divided completely; and this is done by carrying the knife,

after formation of the flaps, round the bone, with its edge rasping on it, and as high up as possible. The instrument is then placed accurately on the point thus exposed, close to the soft parts, and during the sawing the flaps are retracted by the hands of an assistant. The saw may be worked either horizontally or vertically : the latter direction is to be preferred, for thus, when the section is nearly completed, the uncut part of bone is deep, and less likely to snap on the weight of the limb being allowed to operate, or when undue pressure is made downwards. If splintering of the bone have occurred, whether from neglect of the foregoing precautions, or by other accident, the sharp projecting parts should be taken away, and the cut surface made quite smooth by means of the bone-pliers ; and with this instrument also, the sharp edge of the bone may be rounded off, in cases where subsequent pressure might cause ulceration or sloughing of part of the integument of the stump.

The arteries are tied close to their connexions. Their cut ends are laid hold of with the dissecting forceps, and pulled out ; a small firm thread, either linen or silk, is then applied tightly, and one end immediately cut away close to the reef-knot. Separation of the ligatures generally takes place from the sixth to the tenth or twelfth day ; they produce little discharge or irritation during their presence, and no source of irritation connected with them is left behind. But when both ends are cut away close to the knot, separation is long of taking place, and

though the parts may heal over them kindly enough, the stump never can be considered sound till all are discharged. Probably several of these knots remain deeply imbedded after cicatrisation of the integument, and when the patient considers himself cured, and is moving about the room or ward, actively and cheerfully, painful hardness forms deeply, part of the stump reddens and swells, matter forms, and at length the insignificant origin of the mischief is discharged; and this may occur more than once. Generally such suppurations are limited, and soon cease; but occasionally the abscess formed round the knot is extensive, deep and free incision is required, the filling up of the cavity is necessarily slow, the cure is long protracted, and both practitioner and patient are disappointed and annoyed. Besides, the suppurations thus occasioned, though slight in extent, may, when in the neighbourhood of a principal arterial branch, cause ulceration of the coats of the vessel, producing troublesome hæmorrhage at a late period. All these untoward consequences of cutting off both ends I have experienced in a series of cases, and from the results of a faithful comparative trial of both methods, I am now fully determined always to leave one end of the ligature hanging from the lips of the wound.

No one now dreams of the absorption of ligatures, whether composed of animal substance or not; therefore the catgut ligature, at one time much recommended, has no superiority over the linen or silk thread,—besides it is not so convenient of application.

Twisting or bruising the cut ends of arteries has

been long known as effectual in arresting bleeding. Vessels of a large size can be so treated with sufficient facility, and they may not bleed after; but well tied ones are much more secure. The smaller cannot be pulled out and twisted, ligatures must be used for them; and the application of one or two more ligatures, namely, to the large arteries as well as the small, will add to the patient's safety, and to the operator's comfort and peace of mind, and can have little effect in increasing irritation. I have made trial of the method of torsion after amputation, and for the above reasons, and because the manipulations are more tedious, I disapprove of the plan, and decidedly prefer the ligatures. I am not aware that the proposal of leaving the vessels both untwisted and without ligature has been tried in this country; one would think that it must always be troublesome, and not unfrequently hazardous.

In some cases, as when the incisions are made in the neighbourhood of diseased bone, the soft parts are so condensed that the vessels cannot be pulled out by means of the forceps; they are to be transfixed by a sharp hook or tenaculum, and a ligature is then applied round the parts which the instrument holds; or the vessels may be encircled by a thread passed round by means of a curved needle; in both methods more or less of the surrounding tissues must necessarily be included in the noose, though always as little as possible. Sometimes an artery of the bone, whether sound or inflamed, bleeds sharply; in such circumstances the application of ligature is difficult,

and I have occasionally been obliged to insert a wooden peg into the opening ; to this a cord is attached by which it can be removed after a few days.

When bleeding has been satisfactorily arrested, the surface of the wound is to be cleaned of coagula, either with the fingers or with a warm and soft sponge, the ligatures are brought to the margin at convenient points, and the edges of the integument are then put together by interrupted sutures—two, three, or more, according to the extent of the wound. They need not be numerous, for they are only temporary, effecting partial approximation, and showing the line in which the parts are to be brought together by the after dressing. The stump is then covered with lint soaked in cold water, and this application is renewed frequently so long as any trickling of blood continues. Farther dressing is delayed for six or eight hours, when the oozing has entirely ceased, and the visible cut surface become glazed. Under this management, there is less chance of bleeding breaking out afresh than when the limb is encompassed by bandages and pledgets of lint, perhaps compressed so as to interfere with the return of the blood, and heated by superfluous dressings. If bleeding to any extent should occur, as there is always a risk of, after the patient has become warm and comfortable in bed, and reaction has been established, there is but little pain or annoyance in reaching the bleeding point, and taking measures to stop the flow ; the few stitches are soon clipped away, and then the surface of the wound is completely exposed,

and ligatures can be applied to those vessels which require them. Then, after removing all coagula, sutures are placed in the same perforations, and the stump is in as favourable a state as previously.

After six or eight hours, as already stated, any clots that have formed are to be taken away gently, and the glazed edges of the wound are then brought accurately and neatly together by the adhesive composition recommended at page 241 of Part I.,—with the difference of being spread upon slips of oiled silk, which I have found to be more pliable, and altogether preferable to the glazed ribbon. Interstices are left for the sutures and the ends of the ligatures, and the latter may now be abridged slightly. This mode of keeping the edges in contact I can confidently recommend from experience. The plasters are much more adhesive than those in common use, do not irritate, and are not loosened by discharge. After twelve or twenty-four hours, not longer, the sutures are clipped through and removed. No other dressing is required till the end of the cure, provided this proceed favourably. The part is kept cool, and the slight discharge which occurs in a day or two is wiped up from time to time, if it be in such abundance as to reach the oiled cloth over the pillow on which the stump is laid. No disturbance of the parts is necessary as when ointments, bandages, and compresses are employed, or straps that require frequent removal and reapplication. The patient suffers nothing comparatively; and the surgeon is saved much troublesome and dirty work,—for union by the first intention seldom fails.

Bleeding within a few hours after the operation, before excited action of the vessels has commenced, is easily arrested by exposure of the surface, removal of all clots, for by these hæmorrhage is encouraged, and by including the open vessels in ligatures. For the accomplishment of this, the period and mode of dressing, above recommended, afford great facility, as has been already observed. Hæmorrhage at a later period is not common. It happens occasionally in consequence of the stump having acquired an unhealthy condition, from sloughing,—or from abscess, as when this occurs round ligatures which have been retained, along with the slough of the vessel and cellular tissue, both ends having been cut away. The matter formed during separation of the ligature in the usual way, escapes readily along the protruding end, but when there is merely a knot, the integuments have most probably closed over, there is no direct outlet; the matter is confined, and causes ulceration of the coats of the vessel as well as of the surrounding tissues. In this kind of bleeding, it is needless to attempt finding the bleeding point by tearing open the stump, separating any adhesions that may have formed, causing much pain and retardation of cure. And even though the bleeding vessel or vessels could be found, they are not in a state to hold a ligature. The artery is surrounded by sloughing cellular substance, its coats are tender, and in no condition to assume a healthy action necessary for permanent closure after deligation. If ligature is applied, the included part quickly separates, and then the vessel is as open as before. As-

tringents, and even the cautery, are useless. Ligation of the main arterial trunk, above the origin of branches supplying the stump, so as to weaken for a time the circulation, is found to be effectual. I have had recourse to this in many cases, and uniformly with success. Some years ago, several occurred in the Royal Infirmary, within a very short time of one another; it was during rather an unhealthy season, and at the time I was making trial of cutting off both ends of the ligatures. They were all after removal of the lower limb; one patient died—the amputation was high, through the trochanter minor, and the vessel tied secondarily was the common iliac; this had the effect of completely arresting the hæmorrhage, but the previous loss of blood proved too much for the system to recover from; transfusion was had recourse to, and produced temporary benefit. The others, cases of amputation below the knee, made most favourable recoveries after ligation of the superficial femoral, and in more than one the stump healed very rapidly after its readjustment. Indeed it is not unfrequently found that when the flaps are separated, from whatever cause, and replaced when the granulations have appeared, there follows a rapid union and cure.

When healing by the first intention has failed, fomentation and poultices are generally the most grateful and beneficial applications for a day or two. Afterwards, when suppuration has been fairly established, and the stump begins to be flabby and œdematous, simple dressing and uniform support by bandaging are required, sometimes along with com-

presses on particular points to prevent lodgement of matter.

Sometimes the secondary hæmorrhage is not an arterial and rapid flow, but a slow and continued oozing from a cavity, ulcerated, dark, and angry, round the end of the bone ; this seems to arise from diseased action in the cancellated tissue of the bone. Removal of the coagula, stuffing the cavity with dry lint, and the application and continuance of firm pressure, generally suffice for its arrestment.

Hitherto, these general observations on amputation have regarded the operation by flaps only ; the circular method has not been mentioned. The reason is, that the circular amputation has been now almost entirely abandoned in this country, at least in this part of it. And its inferiority to the method by flaps is so obvious, and so generally acknowledged, that detail of the different steps of the operation is, I conceive, here altogether unnecessary. It is more tedious in performance, more painful to the patient, does not afford so good a covering for the end of the bone, and consequently not so convenient and useful a support for an artificial limb, and the cure of the wound is protracted. The stump is always conical, the end of the bone is, ultimately at least, covered only by integument, and from even very slight pressure this is apt to ulcerate ; exfoliation of the bone follows to a greater or less extent, or unhealthy ulcer of the soft parts continues, along with caries of the bone, and partial death of its surface ; and at length it becomes necessary either to perform a second amputation or

to curtail the length of the bone. It may sometimes succeed tolerably well when there is but one bone; when there are two, it is altogether vile and inadmissible.

Various accidents and diseases require removal, either primary or secondary, of the *fingers*, or of parts of them. Amputation is most easily accomplished at the articulations, and ought therefore always to be performed at these points, when the circumstances of the case permit. The last phalanx may require removal either on account of severe injury, or from incurable disease, as onychia maligna, necrosis, caries, &c. The operation is one by single flap, and may be conducted in one of two ways. The doomed phalanx is grasped, on its anterior and posterior aspects, by the fore and middle fingers of the left hand; and the articulation is flexed almost to the full extent, in order that incision into it may be facilitated. A straight, narrow, and sharp-pointed bistoury is carried in a semicircular sweep over the fore part of the joint, so as to divide the integuments, and open completely the articulating cavity. The remaining ligamentous investments of the joint are divided by one or more additional touches of the knife, so as to loosen the base of the phalanx. The fingers of the left hand are then changed from the fore and back parts of the phalanx to its sides, the edge of the knife is passed behind the base of the bone, and the surgeon, by carrying the blade forwards and downwards, forms a flap of sufficient dimensions to cover the

wound, and removes the offending part. There is seldom any trouble from hæmorrhage ; no ligatures are required. The flap is turned up so as to form a cushion over the exposed surface of the middle phalanx, and is retained so by the adhesive composition formerly mentioned, or by one or two turns of a linen bandage. The other method of operation is the reverse of the preceding. The joint is extended, the bistoury is made to transfix close to the joint and at its posterior part, and by then carrying it downwards and forwards, as before, a similar flap is formed ; this is retracted by an assistant, and with one sweep of the knife the articulation is divided from behind forwards. By either method the flap is the same. By similar procedure the amputation at the middle articulation is performed.

It is sometimes an object to save as much as possible of the proximal phalanx, when amputation is rendered necessary by disease of the middle articulation, or of the distal extremity of the bone. In such cases, two semicircular flaps are made by cutting from without, either on the lateral, or on the thenal and anconal aspects, and the bone is divided either by a small saw or by the cutting pliers. The flaps are retained in apposition, and the bleeding arrested by bandaging.

Amputation at the proximal articulation is also performed by double flap. In the previous operations an assistant steadies and supports the hand ; in this he has likewise to bend the rest of the fingers, and to separate as widely as possible those neighbouring

to the one about to be removed. The operator seats himself before the patient, grasps the finger so as to manage its movements with the left hand, and holding the knife perpendicularly, with its point upwards, lays it over the knuckle, and carries it obliquely upwards so as to open that side of the articulation. He then pushes the finger towards the opposite side, and with the point of the knife completes the loosening of the articulation; for this the blade of the instrument should never be employed, otherwise the integument will be cross-cut and mangled. After separation of the base of the phalanx by the point, the blade is passed behind, and carrying it downwards and outwards, a flap is formed similar to the first—both proportioned to the size of the wound which they are to cover, and the bone which they are to protect. They are retained in contact by bringing the neighbouring fingers towards each other. This also suffices, in general, to suppress the bleeding, but sometimes one or both digital arteries require ligature. At first cold cloths are probably the best applications, with the view of stopping the oozing, and warding off inflammatory action. Vascular excitement is very apt to follow this amputation, when performed for disease of the finger, as after neglected or severe whitlow; the soft parts in which the incisions are made are generally infiltrated and condensed, and prone to inflammation. The surface around is red, tense, and shining, on the second or third day; the back of the hand, the palm, and perhaps the forearm, are then involved in inflammation

of the surface, and infiltration of the cellular tissue ; and in all probability, free incisions, followed by poultice and fomentation, will be necessary to restore the parts to quietude. Such consequences, therefore, are to be guarded against, by attention to the system, and avoiding all irritating dressing.

The phalanges of the thumb are removed in the same manner as those of the fingers. Amputation of the metacarpal bone is accomplished thus. The thumb is grasped by the fingers of the left hand, and so managed. The bistoury, held in the same manner as for amputation at the proximal articulation of the finger, is placed with its point on the web betwixt the thumb and forefinger, and carried in one sweep rapidly upwards in a slightly oblique direction, till it is stopped by the os trapezium. The point is used to effect disarticulation, the member being at the same time pushed steadily outwards ; the blade is then placed behind the base, carried downwards close to the side of the bone, and is not to be brought out till sufficiently low down for forming a flap to cover the whole wound. After arresting the hæmorrhage, the flap is laid smoothly down, and retained in its proper position by bandage or slips of the adhesive plaster. The metacarpal bone of the little finger is removed by the same method of incision as for the thumb.

In amputation of the fingers, the incisions sometimes require to extend beyond the proximal articulation, on account of disease having involved that part ; in other words, it may be necessary to remove more or less of

the metacarpal bone along with the finger. The method of incision will vary according to the extent to which the bone is diseased. When the operation is required for disease of merely the distal extremity, the incisions are made in the same form as for amputation of the joint, only they are on each side sufficiently high to be beyond diseased bone. They may either be made from below upwards in the usual way, or be commenced at their highest point on the dorsum of the metacarpal bone. After the soft parts have been separated from the bone, by a few touches of the knife after formation of the principal incisions, removal is completed by either the cutting pliers or the metacarpal bow-saw—the former I have found the more convenient instrument. It is applied perpendicularly, and should always have its smooth surface in contact with the part to be retained, otherwise the cut part will be rough and irregular. Section is completed more rapidly than by the saw, and, by attention to the above precaution, the stump is equally smooth, if not more so. The wound is brought and retained in contact by approximation of the fingers. But in taking away any considerable portion of the metacarpal bone, it is of importance to preserve the palm uninjured. With this view, the knife is entered over the dorsal centre of the bone, above the diseased part, and carried straight downwards till near the articulation, when it is made to diverge for the formation of lateral flaps; the integuments in the track of the longitudinal wound are then dissected backwards, so as to expose the bone completely, and the

bistoury is passed round the bone throughout its whole extent, the edge being kept close to it,—in order that the soft parts may be separated, and that without unnecessary width of wound. Then the bone is clipped at the proper point by the cutting pliers; or the section of the bone may be performed before separation of the soft parts from its under surface, as, by raising the cut end, this part of the operation may be facilitated. Here the metacarpal saw is inapplicable.

Before quitting this part of the amputations, it may be observed, that no good can result from taking away a metacarpal bone and leaving a finger, or from removing a proximal phalanx and leaving the distal. The parts so left can be of no use, they have no support, and no muscles or tendons; they must prove an incumbrance, and as such will either form the subject of a second amputation, or remain a proof of the unsuccessful result of the first.

Amputation in the *forearm* may be necessary at various points, on account of accident or disease, but should never be resorted to, in either case, so long as part of the hand can be saved. The preservation of even a small portion of this useful member is of great importance to the patient. When, however, this is hopeless, all must be removed; and if the wrist be sound, amputation may be performed at that joint. Hitherto, no mention has been made of the temporary suppression of bleeding, for in the amputations detailed there is scarcely ever any necessity for adopting such measures; but in those of the forearm and arm, a

steady assistant must be placed ready to compress the humeral artery as soon as the incisions are commenced; in the case of the forearm, the pressure is made at a low point of the artery; in the arm, the point of pressure will necessarily depend on the point of removal. The patient may be either seated or recumbent. One assistant compresses, another steadies the limb in the supine position. The surgeon holds the hand in his left, standing on the inside of the right limb and on the outside of the left. Suppose the right wrist is to be operated on,—the end of the ulna is felt for, and at that point the knife is entered; it is held in a horizontal direction and pushed across the joint, emerging over and close to the end of the radius. By rapid and gentle sawing motion downwards and forwards, a flap of sufficient size is then formed. This is retracted by the assistant, the joint is opened and its apparatus completely divided, the blade of the knife is laid behind the carpal bones, and by carrying it downwards and backwards, a second flap is formed posteriorly, and the part removed. The dorsum of the hand may be so diseased or injured as not to afford sufficiency of sound parts for a posterior flap; in such circumstances the anterior must be made proportionally large, that it may alone cover the ends of the bones. After suppression of the bleeding, the flaps are approximated by one or two points of suture, and afterwards these are removed, and their place supplied by the adhesive plaster.

Amputation, at any point between the wrist and elbow-joints, requires, in all, the same method of

incision, but the nearer to the elbow the better is the stump; at the wrist the flaps are composed principally of integuments and tendons, and the cushion so formed for the bones is very inferior to one of muscle. Compression is made and the limb steadied as before, the surgeon with his left hand grasps the wrist, and places the forearm in the middle state between pronation and supination. In the right forearm, the knife, held perpendicularly, is entered over the centre of the radius; and its point, after reaching the bone, is inclined inwards so as to pass round it; transfixion is then made, the knife passing close to the palmar surface of the bones, and emerging at a point opposite to its entrance; and then by rapid motion downwards and inwards a proper flap is formed. The instrument is again introduced over the radius, at a little distance from the upper part of the first wound, and passed on the opposite side of the bones, emerging also in the first incision and at a similar point; another flap is made. These are retracted, the knife is swept round the bones, and passed freely between them, to divide the remaining muscular substance, and after this has been completed the saw is applied. During the sawing it is well to preserve the limb in the same position as during the incisions, and to apply the instrument perpendicularly; thus both bones will be divided at once, and the risk of splintering diminished. In transfixion, great care is required that the point of the knife pass across, not between, the bones, and with this view a slight change of position is useful; during the transfixion for the

inner flap, the surgeon, as soon as he feels the knife rounding the radius, rotates the forearm gently inwards, and in transfixing for the outer flap similar rotation is made outwards. Sometimes slight difficulty is experienced in tying the interosseal artery. The flaps are brought together, and treated in the way already mentioned.

In all amputations of the upper extremity, it is of importance, and indeed a rule scarcely to be departed from, to leave as much of the limb as possible; for here the longer the stump, the more useful is it to the patient. In accordance with this maxim, amputation at the elbow-joint may be required, when either disease or injury extend too high for amputation in the forearm, but not too high for the formation of an anterior flap over the joint. The limb is steadied in the supine position, compression being made near the middle of the humeral; the knife is passed horizontally across the condyles close to the bone, and brought downwards and forwards to a sufficient extent for the production of a flap, which is alone to form the protecting cushion. The joint is then cut through, the knife is passed down till obstructed by the olecranon, and with one sweep a semicircular incision of the posterior integument is made. All soft parts in this line are divided, and then the saw is applied to the olecranon process. This amputation is easy, rapid, and beautiful in execution, and when the flap is sufficiently large,—as it always may be, for there is no want of soft parts in front,—the stump is well formed and useful. The flap is laid

down, and attached by suture to the integument posteriorly ; in due time the adhesive dressing is applied. The circumstance of a secreting surface forming the stump does not seem detrimental, either here, or in the wrist-joint. The synovial fluid soon ceases to distil, and union is not interrupted by it. There is no necessity for scarification, with the view of hastening cessation of secretion and granulation of the surface.

Amputation of the *arm* is performed by the formation of lateral flaps, at any point below the insertion of the deltoid muscle. Compression is made on the upper part of the humeral, or on the axillary artery. The limb is held well separated from the side ; and care should be taken that, when so raised, its height be convenient to the operator. The knife is entered perpendicularly to the shaft of the bone, passed fairly down to it, and then inclined along its side ; the operator now grasps the limb below the line of incision with the left hand, and pulls the muscles towards him—it is supposed that the right arm is amputated, the surgeon standing on the inside, and an assistant supporting the forearm—and then completes transfixion, inclining the handle of the knife towards himself, in order that its point may pass round the bone and emerge at as distant a point in the circumference of the limb as possible. By a rapid sawing motion, downwards and inwards to the proper extent, the inner flap is formed ; and by attention to the grasping of the muscles and the inclination of the

knife, its base is so large as to admit of the more easy performance of accurate transfixion for the outer—that is, the instrument is more easily brought through the same incision. The assistant seizes the extremity of the inner flap as soon as formed, and retracts it, but only to a slight extent; it is simply held out of the way. If it be pulled backwards as in retraction during sawing, the formation of the second will be much impeded. The knife is again entered about half an inch below the commencement of the first incision, and by inclining the handle the point is brought round the bone, and made to appear on the opposite side also in the first incision; this is facilitated by pulling the soft parts outwards with the left hand. Then the outer flap is completed. The knife is swept rapidly round the bone, so as to expose it completely at the upper part, the assistant at the same time retracting the flaps fully. The saw is applied, the arteries tied, the flaps approximated, and the operation completed.

In performing the second transfixion, the reason why the knife is entered lower than in the first, is, that cross-cutting of the corners of the wound is thereby avoided. For long I was surprised and annoyed to find many stumps present an unseemly cross-cutting of the integument at the upper parts, particularly after approximation of the flaps, although the incisions seemed to have been made smoothly and accurately. It is occasioned by the sawing process for making the second flap, and when this is commenced at the same height as for the first, irregularity of incision at the upper part is unavoi-

able. The precaution, however, of making the second transfixion considerably lower than the first I have found quite effectual. The disparity between the bases of the flaps is readily and quickly remedied, after their formation, by a sweep of the knife upwards on the lower side.

The formation of *neuromata* occurs more frequently after the amputations of the arm and forearm than in any other. The disease, however, is less common than formerly, and this may be fairly attributed to the improvements in the operation—to the method by flaps having superseded the circular, and nothing but the arteries being surrounded in ligature. Still the affection is occasionally met with, and there can be none more painful and troublesome. Generally, no obvious cause can be found for its attack; but in some of the cases there would seem to be a constitutional and innate tendency, as it were, towards the formation of such tumours—as in the following case: A gentleman, aged 53, underwent amputation of the thumb, in consequence of laceration of the hand. Amputation was very soon afterwards performed at the middle of the forearm, on account of hæmorrhage and infiltration of the hand, after fruitless attempts to secure the arteries. After cicatrisation of the wound, he complained of great pain in the stump, and in the situation where the tourniquet had been applied. Amputation of the arm was then performed, but the stump was not well made. The pain returned, and he applied to me, with the view of again submitting to amputation. It was performed nearer to the shoulder-joint, and in order to guard

against recurrence of the disease, the nerves were laid hold of, pulled outwards, and cut across as high as possible. The patient was relieved of many of his sufferings, and continued tolerably comfortable for nearly two years; again, however, the painful symptoms have returned, though in a slighter degree. On examining the removed stump, all the nerves, particularly the musculo-spiral, were found greatly enlarged in their extremities, and intimately adherent to the cicatrix and the ligamentous covering of the rounded extremity of the humerus.

Amputation at the *Shoulder-joint* is more frequently required for accident than for disease. It has always been the custom to trust, for suppression of bleeding during this operation, to the hands of an assistant; and when the method has been found effectual in the case of the large axillary artery, why object to it, on the score of inefficiency, in the minor amputations? particularly when it is evident, putting efficiency out of the question, that it is preferable to compression by the tourniquet, or any other circular apparatus—more quickly applied and relaxed, less painful, less formidable, always ready, and independent of the instrument-maker? The compression is made above the clavicle, so as to secure the subclavian, where it passes over the first rib. The thumb of a steady assistant is placed deeply into the cavity of the lower triangular space of the neck, immediately above the first large sinuosity of the clavicle. The pressure thus made, is quite effectual; but as it

requires to be firm and uniform, and as there is always a risk of the thumb giving way from exhaustion, it is better to interpose some mechanical contrivance when the assistant is either diffident or inexperienced. The best apparatus for this purpose is a common door-key. A bit of lint or cloth is wrapped round the handle, and this part is then pressed down on the vessel. As in other amputations, the pressure is not commenced till the knife is about to enter.

The flaps may be double, on the outer and inner aspects, or one may be made sufficiently large to cover the whole wound. The patient is seated on a chair, and secured by a person placed behind. The arm is raised a little from the side, and supported by an assistant. Two oblique incisions are made, commencing high on each side of the shoulder, and converging gradually till they meet near the insertion of the deltoid. The triangular flap, so marked out, is dissected rapidly upwards, close to the bone, and kept raised by an assistant. The person supporting the arm then uses it as a lever, carrying it downwards and backwards; the joint, thus made more palpable, is cut into by a semicircular sweep of the knife across it; the head of the bone is now dislocated, and the rest of the capsule and fibrous tissue exterior to it divided; the blade of the knife is insinuated behind the head of the bone, and carried rapidly through the remaining soft parts. In no amputation can I conceive any necessity for suspending the incisions, in order to secure vessels, provided the pressure is well applied, and the knife used dexterously. Here there is very little blood lost. The vessels di-

vided in the formation of the flap are small, and the axillary is not cut till the incisions are nearly completed ; as soon as the limb has dropped, the surgeon places his finger on the mouth of the artery, and then applies his ligature as quickly as possible ; the pressure may now be removed, and the minor vessels secured leisurely. The flap covers the wound completely, and is easily retained.

Or two flaps may be made by transfixion. In operating thus on the right limb, the surgeon, standing in front of the patient, enters the knife a little below the point of the acromion, passes it across the outer aspect of the joint, and by inclination of the handle outwards, makes its point to appear on the inside of the outer margin of the axilla ; by carrying it downwards and outwards to a sufficient extent, the outer flap is formed. This is immediately elevated by an assistant, and then the arm is pushed upwards, and across the chest, so as to render the joint more accessible ; the ligaments are cut, the bone disarticulated, the knife passed beyond its head, and placed with the edge parallel to the shaft of the humerus, and the arm restored to its former position ; the inner flap is then made, by carrying the instrument downwards and inwards. In the left limb, the knife is entered on the inside of the outer border of the axilla, and brought out below the extremity of the acromion, reversing the order of the former incisions ; after the outer flap has been so formed, the joint is cut across, the knife passed beyond the head of the bone, and an inner flap made, as before.

Accidental injury, as already stated, is the most

frequent cause of amputation at this part, and this will always influence the method of incision. There is nothing peculiar in the after treatment of the stump. But it ought always to be remembered, that the operation is one of great severity, that a large part of the body has been suddenly removed, that, consequently, there is risk of the mere shock being dangerous, and of an untoward constitutional condition supervening—and, therefore, the after attendance should be zealous and careful.

The phalanges of the *toes* are removed in the same way as those of the fingers. In the amputation at the proximal joint, it is to be recollected, that the extremity of the metatarsal bone lies more removed from the web of integument betwixt the toes, than the metacarpal bone does from that of the fingers. The incision upwards, therefore, requires to be deeper; but in other respects the operations are precisely the same.

In amputating at the proximal articulation of the great toe, there is often a difficulty in obtaining a sufficient covering for the wound, on account of the presence of the sesamoid bones, and the general bulging of the bones. The knife is entered on the dorsum of the metatarsal bone, about half an inch above the joint, and then inclined to each side, marking out lateral flaps of considerable length; these are then reflected,—in making the outer, the instrument being dexterously passed round the sesamoid bone,—and the disarticulation completed.

In removing the great toe, along with the metatar-

sal bone, the bistoury is entered over the articulation of the metatarsal bone with the tarsus, and carried straight downwards, along the centre of the dorsum of the bone, till near its extremity; it is then inclined to each side, in the manner described for amputation of the metacarpal bones. The integuments are dissected off on each side of the longitudinal incision, and the knife run up along the inside of the bone, till stopt by the tarsus. The surgeon now presses the toe outwards, so as to assist the disarticulation; and after this has been completed, the bistoury is carried downwards, close to the outside of the bone, and not brought out till past the lower articulation. The external flap thus formed is then laid accurately down, so as to cover the wound, and retained. Or the flap may be formed previously to the disarticulation, by running the knife upwards along the outside of the bone, and then effecting removal. The operations on the other metatarsal bones are the same as those on the metacarpal. They may be removed, either entirely or in part, along with the corresponding phalanges, by operative procedure similar to that practised on the hand.

Sometimes disease of the foot is not so extensive as to require or justify removal of the whole organ; the metatarsal bones are not involved throughout their whole extent. The same remark applies to injury by accident. In such circumstances, amputation is performed at the articulation of the metatarsal bones with the tarsus. The operator first ascertains the exact site of these joints, and then transfixes the

foot at that point, passing the knife close along the plantar aspect of the bones; carrying the instrument downwards, a sufficient flap is formed to cover the stump. The integuments on the dorsum are then divided in the line of articulation, the joints divided successively, and the parts removed. The flap is raised, adjusted, and retained. In dividing the articulations, it is to be recollected, that the base of the second metatarsal bone, reckoning from that of the great toe, is lodged considerably higher than the others; and, therefore, the knife must be inclined upwards at that point, or else the use of the saw is requisite. The stump thus formed proves exceedingly useful: the subsequent lameness is not great; the heel and tarsus compose a very efficient support for the weight of the body, and the flexion is unimpaired; by attention too, the deformity may be in a great measure concealed. In short, the surgeon who amputates above the ankle, for disease or injury not extending to the articulation of the metatarsus with the tarsus, is guilty of a serious error.

The disease may reach higher than is compatible with the preceding operation, and yet it may be possible to save the heel. In such cases amputation is performed in the articulations of the os calcis with the os cuboides, and of the astragalus with the os naviculare. The plan of the incisions is the same as that for the operation at the bases of the metatarsal bones.

No amputation is more frequently performed than that of the *leg*. Operation near the ankle is inad-

missible ; sufficiency of soft parts, for the protection of the stump, cannot be procured lower than the calf. Incision is consequently limited to two points, either immediately below the tuberosity of the tibia, or in the bellies of the gastrocnemii. The former is the situation to be preferred in hospital practice, and amongst the lower orders generally ; the latter is suitable to the better classes of society, that is, to those who can afford to purchase an expensive artificial support. The amputation below the tibial tuberosity being the most frequently required, will, with propriety, be described first. Suppose the right leg is to suffer.—The operator places himself on its inner side, according to the general rule formerly inculcated, and grasps the lower part of the limb with his left hand, an assistant supporting the foot at a proper height, and controlling motion. The knife is entered over the fibula, on its outer aspect, and carried upwards along that bone for an inch and a half, or two inches ; it is then brought across the limb in a semilunar direction, and after reaching the inner and lower part of the tibia transfixion is performed, the instrument being pushed along the posterior surface of the bones, and made to emerge at the upper part of the fibular incision. By then carrying the knife downwards, a posterior flap is formed sufficient to cover the stump. All this is effected by uninterrupted sweeps of the knife, that is, without ever removing the point from the track of incision. The integuments on the fore part are then dissected upwards a little, by a few touches of the knife, so as to form a small semilunar flap ; at this part of the ope-

ration there is no necessity for laying down the knife and using a bistoury. The muscles in the interosseous space are then completely divided, and the knife swept round the bones to detach the soft parts still uncut. The saw is applied, either in a horizontal or perpendicular direction; I prefer the latter for reasons already assigned. The vessels are secured, and there are generally but three—the popliteal, and two sural. Before adjusting the flap, it is well to assist nature in rounding off the end of the tibia, and thereby prevent danger to the integument;—with this view the sharp anterior ridge of the bone is cut away and rounded off by means of the pliers. To some the fibular incision may appear unnecessary; but I have long practised it from conviction of its advantage. It is an excellent mark for transfixion, and assists greatly in preventing entanglement of the knife betwixt the two bones; besides the soft parts there must be divided at one or other step of the operation, and hence the procedure cannot be objected to on the ground of causing unnecessary wound. In operating on the left limb, there is not the same danger in transfixion, and consequently so long a preliminary incision on the inside is not requisite; in other respects the steps of the operation are the same as for removal of the right.

It has been proposed to excise the head of the fibula after formation of the flap, instead of sawing it across at a corresponding point with the tibia. At one time I put this modification into extensive practice, with the effect of improving the appearance of the stump very considerably; but in several cases,

untoward consequences took place. Discharge of clear fluid resembling synovia occurred on the second day, followed by very profuse suppuration, which proved of long continuance, and very exhausting; in more than one case, the joint became ankylosed, rendering the stump very inefficient as a means of support, in consequence of being fixed at an inconvenient angle; and one patient sank, exhausted by the profusion of the discharge. I then found, from repeated examination of the parts on the dead subject, that it was very difficult, nay impossible, to excise the head of the bone without either wounding the synovial pouch itself,—that is, dividing the capsular ligament,—or opening a bursal cavity, beneath the popliteus muscle, communicating with that of the knee-joint. It is scarcely necessary to add, I have since wholly abandoned this method of operation.

It has been already observed, that high amputation of the leg is preferable amongst the poor. The limb is of much greater use to the patient than were the stump longer; he is able to follow his occupation with greater ease and security, and at less expense, by resting on the knee, than by using the artificial limb applied to the middle of the leg. The wealthier patient, however, can afford a more expensive support, and a less efficient, though more handsome continuation of the limb suffices. In such circumstances, amputation is performed at the middle of the leg; and after cicatrisation, the artist supplies an artificial support resembling the natural limb; thus the motion of the knee is preserved. The same directions

apply to this operation as to that immediately below the knee.

In amputation of the *thigh*, the same method of incision is followed as in amputation of the arm. But, according to the point of removal, the direction of the flaps varies. If in operating high in the limb the flaps be made laterally, there will be imminent risk of the bone protruding through the upper part of the wound ; for the patient uniformly raises the stump towards his abdomen. No antagonist muscular power is left to oppose the action of the muscles inserted into the trochanter minor, and the elevation of the stump is involuntary ; it always occurs to a remarkable extent in young persons. On this account, anterior and posterior flaps are here far preferable to the lateral ; for then the more the stump is raised, the better is the end of the bone covered—the anterior flap folds over it. Transfixion is therefore made horizontally ; and the posterior flap should be a little longer than the anterior. But in the lower part of the limb, lateral flaps are not only not liable to the same objection, but preferable to the anterior and posterior. In the neighbourhood of the knee-joint, the soft parts consist almost entirely of ligamentous tissue on the fore and back part, and proper cushions can be obtained only from the sides. Transfixion is therefore made perpendicularly. Thus the bone will be well covered by parts likely soon to adhere ; and there is no risk of protrusion, for muscles are left to counteract the elevators, and there is sufficient lever in the limb whereby to control its motions. And it may be here

mentioned, that after all amputations, when startings of the muscles are not only painful, but disturb the position of the stump, the limb should be bound down by a broad band, passed across it a short way above the wound, and fastened firmly at each end to the bed or pillow ; at the same time anodynes are to be administered.

Amputation at the *hip-joint* is deservedly ranked amongst the most formidable operations in surgery. It ought, therefore, never to be performed but as a last and necessitous resource for the salvation of life. At the same time, when necessity for it is obvious and acknowledged, and no other means can be of any avail, hesitation and delay should never take place ; otherwise the last and only chance of saving the patient will pass away, and the operation, when at length performed, will but hasten his exit from this world,—and besides inflict an injury to science, by intimidating practitioners, and affording subject of reproach and ridicule to the thoughtless and uninformed part of the public. I prefer the formation of anterior and posterior flaps,—as follows. The patient is placed recumbent on a firm table, his nates resting on, or rather projecting a little over the front edge. The sound limb is separated from the one to be removed, and held aside by an assistant. Or it is secured to the foot of the table by a towel, the necessity for an additional assistant being thus done away with, and more freedom in his movements afforded to the operator. Indeed, in all amputations of the lower extremity, this is the preferable method of fix-

ing the sound limb. The other limb is supported by an experienced and intelligent assistant, who understands, and is able to perform, the movements to facilitate the different steps of the operation. The compression is intrusted also to an experienced and steady assistant, who, standing by the patient's side, presses firmly with one or both thumbs on the femoral artery, where it passes over the pubes ; and in this more than in any other operation, should the pressure be delayed till the instant of incision, for otherwise the blood lost *in* the limb will be immense. Transfixion, by a knife proportioned in size to the dimensions of the limb, is made horizontally, the instrument being passed in a somewhat semicircular direction, so as to include as much of the soft parts as possible ; an anterior flap is made by cutting downwards. During the passage of the knife across the joint, the assistant rotates the limb a little so as to facilitate the bringing of the instrument out with its point well inwards ; in the left limb the rotation will be inwards, in the right outwards. After formation of the flap, the assistant abducts forcibly, and presses downwards ; the joint is opened, the round ligament cut, the capsule divided, and the blade of the knife placed behind the head of the bone and the large trochanter ; the posterior flap is then made rapidly. After transfixion for the superior flap, and when the sawing motion downwards has advanced but a little way, the compressing assistant shifts his hands into the incision immediately behind the back of the knife, and so obtains a firm grasp of the femoral previously to its division. He retains this hold, at the same

time retracting the flap, during the rest of the operation. As soon as the limb has been separated, the surgeon secures the vessels on the posterior flap, partly by his fingers, partly by compression with a large sponge, and ligatures are applied as quickly as possible. The femoral is secured last, for, as long as the assistant retains his hold, hæmorrhage from it is not to be dreaded. Thus, when both surgeon and assistants are quick and cool, the operation may be completed with the loss of much less blood than might be expected. In cases of accidental injury requiring this operation, the lever use of the limb must frequently be wanting; and in such cases too, the parts may be so injured as not to afford flaps anteriorly and posteriorly. In these circumstances, the surgeon must be guided by experience and judgment in adopting the mode of procedure which appears most applicable; in ordinary cases the operation above detailed appears the preferable.

Excision of diseased portions of bones, is practised occasionally with the view of removing a source of irritation and exhaustion from the system, without sacrifice of a limb. When the operation proves successful, the beneficial effect on the general health is as remarkable and rapid as after removal of the hectic cause by amputation; the pulse falls and grows firmer, diarrhœa and sweating cease, the hectic flush leaves the cheek, in short, the constitution makes a complete and successful rally. It is had recourse to in order to take away disease in the following situa-

tions—in the cancellated articulating extremity of a long bone, in part or the whole of a short bone, and in part or the whole of long bones. Even a long bone, from one articulating surface to the other, may be removed; the metacarpal bone of the thumb, and the metatarsal bone supporting the great toe, may, for example, be taken away in their whole extent. I have seen these bones so treated, but the result was unsatisfactory. As has already been observed, the part of the member that is left is without support, and not under the influence of muscle; it is consequently loose and useless.

Operation for the removal of necrosed, or softened and ulcerated portions of the carpal and tarsal bones, is sometimes successful. But operative interference, either with these, or with more extensive and formidable articulations, is not advisable unless the soft parts are not largely involved, and when the general health is tolerably good—the patient either having suffered less than usual, or having rallied and begun to gain strength after exhaustion by discharge and fever. If the ligaments, bursæ, and cellular tissue are much affected, as is often the case, there is no chance of discharge ceasing, and the patient regaining health, even though the bone be removed to any extent—a second operation will be required, namely, amputation above the diseased parts. And when this becomes requisite, after failure of the first to restore or even improve the health, the patient is apt, as has too often been the case, to sink under the accumulation of suffering. He might, even though much exhaust-

ed, have been able to bear up against the shock of one and a successful operation, but he cannot endure that of a second, or perhaps third, serious and protracted attack of the knivesman. The disappointed hope of a cure is a secondary, though nevertheless a sure contributor towards the unfortunate issue.

No particular rules can be laid down for the operative procedure. By converting two or more natural openings into one, extending the incisions as much as possible in the direction of the limb and of the muscles and tendons, and avoiding the course of the larger bloodvessels and nerves, room is made for an accurate examination of the diseased parts. A strong and firmly pointed knife is required for these incisions, for the soft parts are much consolidated, and are cut with difficulty. The extent of disease is ascertained both by the probe and by the finger, and farther measures, if necessary, are then adopted for complete removal. Loose portions of bone are taken away; and often large sequestra of the cancellated tissue are found lying in the cavity, either loose or easily separable; for extraction, forceps and the fingers, and sometimes a lever, are required. A firm scoop is useful for removing such portions of diseased cancellated tissue as are still continuous with the shaft of the bone. When an opening in the cancellated tissue, leading to an internal sequestrum, is minute, enlargement is effected by means of either the trephine or the cutting pliers; afterwards, gouges, graters, &c., may sometimes be useful in operating on the soft texture underneath,—but they are seldom requisite.

The bleeding from the soft parts is free; the vessels do not retract, and may require the application of a needle and ligature. That from the bone is easily arrested by pressure; the cavity is filled with charpie or with dossils of lint, and these are supported by a bandage. Some days after, this dressing is removed, having been previously softened and loosened by fomentation and poultice. The cavity should now be examined carefully, to ascertain whether or not all the diseased parts have been taken away; it is then dressed daily from the bottom. If parts of the surface assume an unhealthy aspect, the granulations being either backward or flabby, to these escharotics should be applied—the most suitable is the red oxide of mercury. Gradually the cavity fills up, and a depressed, firm, and permanent cicatrix is obtained. It need not excite surprise, however, if, in not a few cases, after matters have proceeded apparently very favourably for some time, the surface become pale, soft, and glistening; the discharge thin, acrid, and profuse; the integuments around tumid and discoloured,—if, in short, the disease be in no long time fully re-established.

The tarsal and carpal bones are often the subjects of this operation. In a few cases I have removed several, in others one or a portion of one, with success. In one instance the greater part of the astragalus was taken away, along with the ends of the tibia and fibula. There remained, in consequence, a large opening across the joint, through which a cord was passed, to facilitate gradual and piecemeal dis-

charge of remaining portions of diseased bone. The articulation could be seen through. The seton was gradually diminished, and the aperture closed. The foot was thus preserved, and the leg was but little shortened; the limb proved strong and extremely useful, but the ankle-joint retained little power of motion. I have also trephined the os calcis and removed large portions of it; the cuboid likewise has been taken away, along with the base of the metacarpal bone or bones in connexion with it; in some of these cases an excellent cure followed, in others amputation of the foot was afterwards necessary.

Some have ventured to cut away the articulating ends of the bones composing the *knee-joint*. This may be accomplished without much difficulty. The patella is either removed entirely or turned to a side, the ligamentous and tendinous attachments are divided, and the ends of the bones thus exposed; by cutting close to and towards them, little risk is incurred of wounding the bloodvessels and nerves in the popliteal space. The saw is readily applied in a horizontal direction. After tying the vessels, and approximating the edges of the wound, the limb is placed in the straight position, and retained fixedly so by the application of splints. Much constitutional disturbance is to be expected, as well as profuse and tedious suppuration. There are few surgeons so rash as to have recourse to this operation. One or two patients, it is true, have lived in spite of it, retaining the limb in a tolerably useful state. But in others,—and these constitute the majority,—amputation was after all

required, and that proved insufficient to save the patient. In short, the results of excision of the knee-joint do not justify its repetition.

The articulating ends of the bones composing the *shoulder-joint* have been removed; and this may be done with advantage on account either of disease or of injury. This joint is, like others, liable to ulceration of the cartilages, either primary, or in consequence of abscess and degeneration of the soft parts around. The disease is attended usually with painful feelings increased by motion, and the patient is indisposed to attempt motion. Sometimes merely weakness of the limb is complained of, and the attention is drawn to the wasted appearance of the muscles, particularly of the upper arm; the deltoid seems shrunk almost to nothing. The motions above the shoulder are lost; and abduction is impracticable. Much pain is produced by pushing sharply the articulating surfaces into contact, and is further increased by rotation. The enforcement of strict and absolute rest of the joint, the establishment of a drain in the soft parts immediately neighbouring, and attention to the general health, often prove sufficient to arrest the progress of this disease. If, however, it is neglected, abscess forms sooner or later. On opening this, and introducing the finger, the joint is discovered to be open; the head of the bone is found detached from the soft parts, and unsupported. Or this state of parts may be ascertained to exist by examination through a sinus, either with a probe, or with the finger after dilatation. In these circumstances, an attempt may

be made to check disease, and preserve the arm, by excision of the obnoxious parts of the bone. And this kind of operation is also justifiable when the head of the humerus has been shattered by musket shot; or when it has been exposed and injured by a splinter, or by a large shot, and the joint laid open. The situation and course of the incisions will be so far regulated by the openings or wounds already existing. They should always be made in the direction of the fibres of the deltoid, and the posterior aspect of the articulation is preferable to the anterior. One incision, from the back of the acromion process to near the insertion of the muscle, is sufficient to expose the head of the bone, to allow all its remaining attachments to be separated, and to admit of its being turned out so as to be conveniently acted on by the saw. Merely the head is taken away. In separating the soft parts from its neck, the edge of the knife should be always directed to the bone, to avoid the nerves and vessels on the inside. In some cases of injury, very little additional wound may be requisite. The glenoid cavity may, in consequence of being seriously involved in disease, also require removal; this is best accomplished by large cross-cutting pliers. Few vessels require ligature. The edges of the wound are brought together; and the elbow is supported, and the arm fixed to the trunk, in order to keep the bones in apposition, and prevent motion. This position must be retained during the rest of the cure; and when the wound is on the outside of the shoulder, as recommended, the dressing of it does not in-

terfere with the retentive apparatus. The discharge gradually ceases, and cicatrisation is obtained, though not till after a considerable time, at least in general. The cut ends of the bones accommodate themselves to each other, and a sort of new joint is formed—but never strong. The motions of the forearm are perfect, though perhaps weakened; those of the upper arm are very incomplete. I have both performed and assisted in the operation frequently, and never experienced any difficulty; a cure has not always followed, but in some cases the limb has become very useful.

The *elbow-joint*, on account of its exposed condition, is generally regarded as the most favourable for excision. As to the truth of this opinion, there is great room for doubt. The affections of the joints of the upper extremity are much more manageable than those of the lower, and may generally be prevented from proceeding so far as to end in destruction of the apparatus. By care and good management, disease will be arrested, and the functions and motions of the parts restored and preserved; or the articulation may become stiff, and even though the ankylosis be complete, the limb will be very useful if the joint have been kept in a good position. The health, if previously undermined, is renovated, so soon as the local disease is arrested. But some bad cases are met with, in which all the parts surrounding the articulation are involved, and the strength wasted; in these, amputation is the only safe and effectual procedure. It is only when the soft parts are not much diseased, when it is ascertainable that

the affection of the bone is only to a limited extent, and when the usual means of cure have had a fair trial and failed, that excision is admissible. In determining on the operation, the time of life and the worldly circumstances of the patient are to be considered; a poor man requires his limb to be serviceable in labour, handsome appearance without utility is to him of no value. The motion and usefulness of the arm may be in a great measure preserved, if only a part of the bone of the arm, or a part of those of the forearm, entering into the articulation, be removed; but if large portions of all of these be taken away, the muscles will lose their support, the motions will never be restored to any extent, and the motion that is will be weak and vacillating. The joint will remain loose and powerless, and the limb will prove to be but a useless incumbrance. Such, at least, is the result of my experience on this subject; and I am sorry to add, that all which has been written on it is not deserving of unreserved belief. Many patients have, after long and severe suffering, preserved the arm to little purpose; others have been necessitated to submit to another operation—amputation after all; some have died after the first, others after the second mutilation. The operation is attended with no difficulty in execution, and this in some measure accounts for its frequent, and it is to be suspected, indiscriminate, performance of late years. The incisions are made on the posterior aspect of the joint. One is placed in the mesial line, extending from about two inches above the olecranon to the same distance below it; and from

this flaps are raised, by making either a cross-cut in the middle, or one at each extremity; in the one case the flaps are four, and triangular; in the other, two, and quadrangular; by either method the bones are readily exposed. The joint is opened and dislocated, and the soft parts separated to the necessary extent from the bones. The ulnar nerve is avoided by dissecting close to the bone. The diseased portions are then sawn off. The wound is closed, and the arm kept bent. By the sanguine supporters of this operation, the after treatment is advised to be conducted so as to secure motion in the new articulation. From this I would dissent, for if the articulating ends of the bones have been actually cut off, the motion may be extensive enough certainly, but both joint and limb will be almost altogether impotent. It would be better to procure ankylosis in the bent position, than to have the arm dangling like a flail; in the one case the limb will be useful; in the other, ornament, and that too of an equivocal kind, is all that it can boast. Even ankylosis, in most cases, can be brought about only after the lapse of a long period. In the more severe affections of this joint, amputation of the limb is the operation which must ultimately be had recourse to, if the patient survive; and it is better to perform this at once, than after the experiment of excision has been tried and found wanting. I am well aware that parents have had to regret and mourn bitterly their having departed from sound advice, and lent themselves to such experimental trials on their offspring.

IN illustration of what has been said in these pages regarding the success attendant on the lateral method of lithotomy, when properly conducted, the following list is subjoined of cases operated on by me in the Royal Infirmary. The accuracy of this statement can be authenticated by reference to the records of the house. For this reason I prefer limiting the list, instead of republishing that given in the *Edinburgh Medical and Surgical Journal*, No. 95, for April 1828, with the addition of my other cases, in private, since that period—though this would show an equally favourable result.

Some cases, in which stones have been broken down and extracted by the urethra, are of course omitted in this list, as well as others in which concretions lodged in the urethra have been extracted by incision of the perineum.

It may require explanation why, in 1830, no patients were cut for stone by me in the Royal Infirmary. This can be given very shortly. By placarding in the streets, and such like means, a good many were induced to apply elsewhere. About the half of these individuals were cured; at least such is the statement of the result published and uncontradicted.

Some writers on medical statistics will find, in the following table, a refutation of their statements respecting the proportion of calculous disorders in Scotland:—

Name.	Age.	Place of Abode.	Occupation.	Date of Operation.	Result.	No. of Calculi.
Charles Gibson	23	Lasswade	paper maker	June 1, 1828	cured	1
Charles Fraser	65	Kincardinesh.	farmer	Aug. 24, 1828		1
George Gouldie	57	Dalkeith	labourer	Sept. 21, 1828	cured	1
Andrew Gillan	68	Edinburgh	ditto.	Nov. 26, 1828	cured	1
Mrs Alexander	38	Ditto.		Nov. 15, 1828	cured	1
John Brown	25	Ditto.	painter	Dec. 10, 1828	cured	1
George Milne	43	Morayshire	farmer	Feb. 5, 1829	cured	1
James Mowat	52	Stonehaven	weaver	April 6, 1829	cured	3
John Cuddy	26	Lasswade	porter	May 31, 1829	cured	3
Alex. Darling	6	Edinburgh		Oct. 16, 1829	cured	1
John Duncan	17	Arbroath		Mar. 8, 1829	cured	1
John Hay	52	Alloa	labourer	Mar. 21, 1831		1
Henry Hinde	20	County Down	ditto.	Sept. 22, 1831	cured	1
David Law	60	Montrose	sailor	Oct. 2, 1831	cured	2
M. McLaughlin	56	Londonderry	labourer	Nov. 23, 1831	cured	1
John Davidson	60	Arbroath	ditto.	April 3, 1832	cured	1
John Bishop	5	Edinburgh		Apr. 16, 1832	cured	1
James Sherrat	67	Montrose	labourer	May 21, 1832	cured	1
James Mellis	56	Banffshire	farmer	June 4, 1832	cured	1
Robert Young	42	Prestonpans	carter	Sept. 12, 1832	cured	1
Alex. Dunbar	73	Strathdon	farmer	Sept. 16, 1832	cured	3
Wm. Webster	65	Old Meldrum	ditto.	Oct. 3, 1832	cured	2
James Skinner	46	Banff	cooper	Oct. 17, 1832	cured	1

Of these twenty-three, two have died—one from the effects of the operation, the other from disease totally unconnected with it.

The cases were not picked. Every patient who presented himself was operated on.

John Hay, a man of lax habit, scarcely recovered from the shock of the operation,—by no means tedious, and unattended with loss of blood—but continued low

and gradually sinking; tympanitis supervened, and he died on the third day. No traces either of inflammatory action or of urinary infiltration could be discovered.

Charles Fraser made a very favourable recovery from the operation. The urine passed by the urethra on the tenth day, and the closure of the wound advanced rapidly. He was seized, however, with typhoid symptoms, accompanied with erratic erythema of the feet and forearm, and died on the twenty-second day—dissection showing nothing in the urinary organs at all connected with his decease. The typhoid erythema was at the time epidemic.

THE END.

The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry should be supported by a valid receipt or invoice. This ensures transparency and allows for easy verification of the data. The text also mentions the need for regular audits to identify any discrepancies or errors in the accounting process.

Furthermore, it highlights the role of technology in modern accounting. The use of software can significantly reduce the risk of human error and streamline the workflow. However, it also notes that proper training and security measures are essential to protect sensitive financial information. The document concludes by stating that a robust accounting system is fundamental for the long-term success and stability of any business.

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Finally, the document touches upon the legal and regulatory aspects of accounting. It mentions that companies must adhere to specific standards and regulations, such as GAAP or IFRS, to ensure the reliability and comparability of their financial reports. Compliance with these standards is not only a legal requirement but also a key factor in building trust with investors and other stakeholders.

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